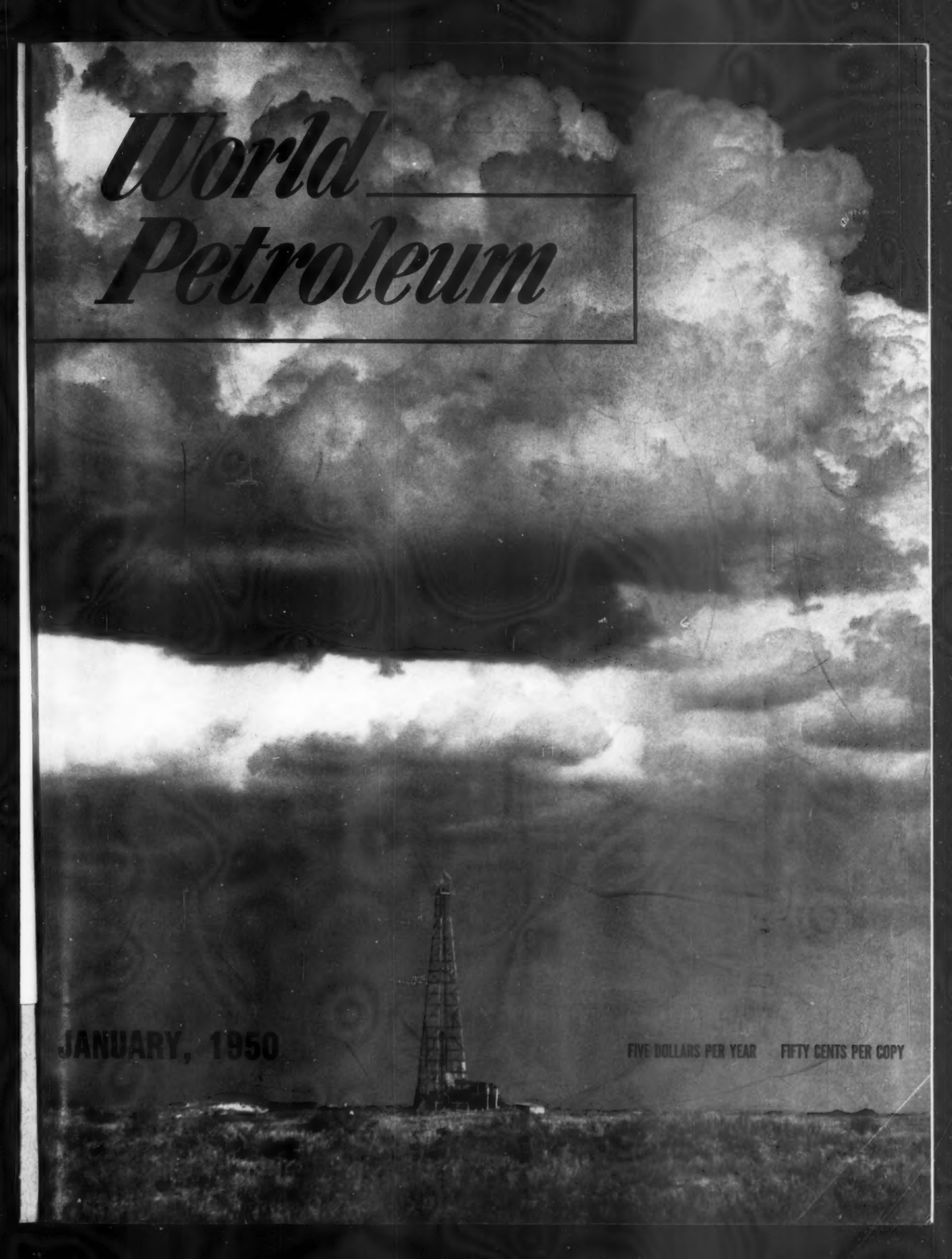
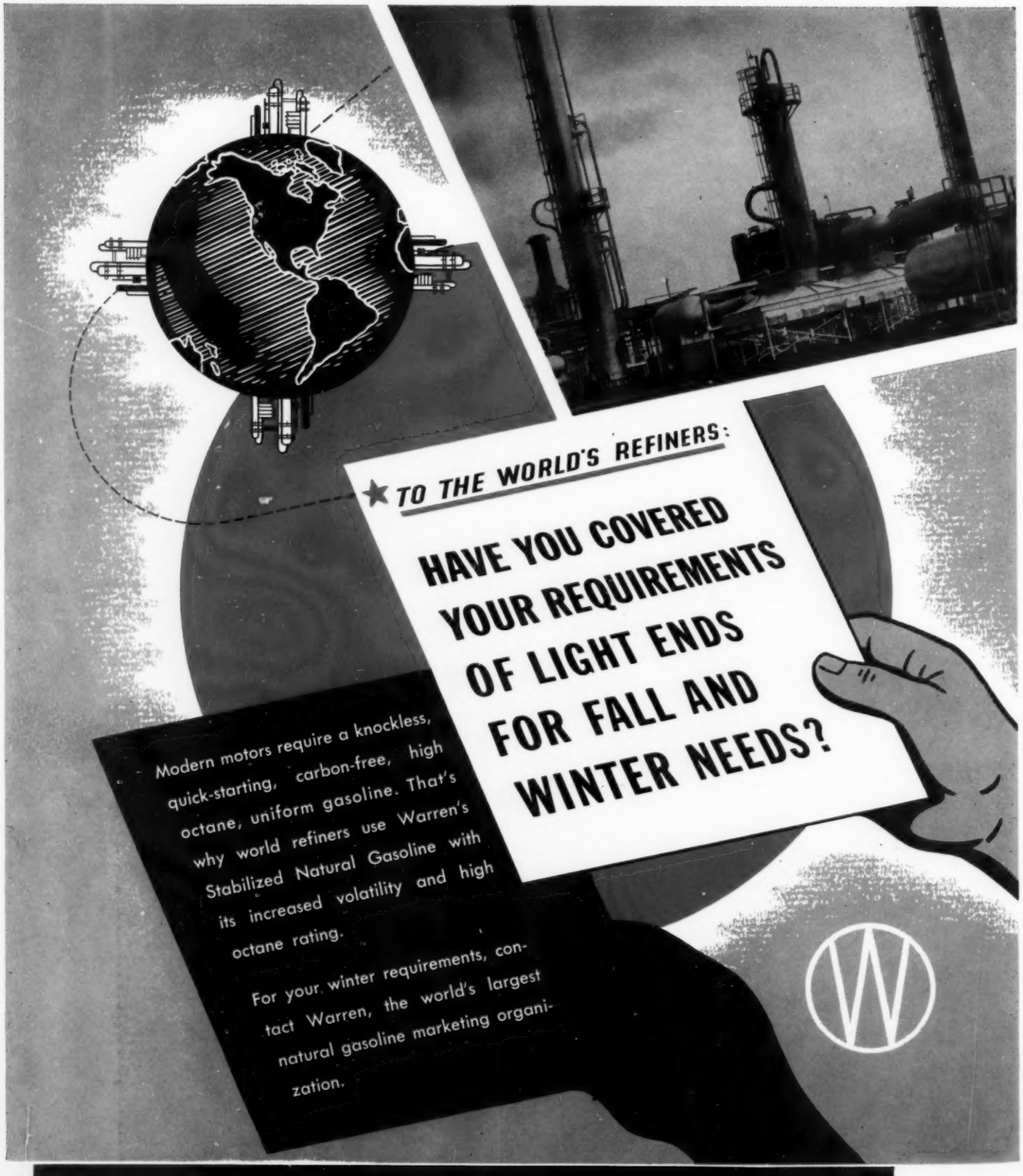
World Petroleum



JANUARY, 1950

FIVE DOLLARS PER YEAR FIFTY CENTS PER COPY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HAVE YOU COVERED YOUR REQUIREMENTS OF LIGHT ENDS FOR FALL AND WINTER NEEDS?
Modern motors require a knockless, quick-starting, carbon-free, high octane, uniform gasoline. That's why world refiners use Warren's Stabilized Natural Gasoline with its increased volatility and high octane rating.
For your winter requirements, contact Warren, the world's largest natural gasoline marketing organization.

WARREN PETROLEUM CORPORATION

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TULSA 2, OKLAHOMA CABLE ADDRESSES: Stavolene, Warren

Crude Oil, Natural Gasoline and Liquefied Petroleum Products

HORTONSPHERES furnish LP Gas

for French city

The LP Gas is butane stored in these Hortonspheres which were recently erected at a refinery in Berre, France. Butane is pumped from the Hortonspheres through four miles of pipe line to a filling station. It is then transferred to seven-gallon bottles. These bottles supply butane for cooking and heating in homes throughout the surrounding countryside.

Here's another case where wise oil men have selected the Hortonsphere for storing a highly volatile petroleum product. What's behind this ever-increasing world-wide popularity? First of all, the Hortonsphere provides an economical means of storing a volatile liquid under pressure. The Hortonsphere is safe too—the vapor space inside remains above the inflammable range making it impossible for flame to propagate inside the tank.

There are many other advantages—such as easy painting—that this efficient container provides. Write the nearest office for Bulletin E to find out more about them.

The three 32 ft. 6 in. diameter Hortonspheres shown below were erected for Compagnie de Raffinage Shell Berre at Berre, France, by our licensee, Constructions Metalliques de Provence. They store butane under 100 lbs. per sq. in. pressure.

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Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
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Driller's Choice
So many drillers prefer Youngstown because they know from long experience that it will perform dependably, whether the going is tough or normal. Youngstown drill pipe is dependable because it is made of finest quality steel by a company which has been fabricating oil country tubular goods for nearly 50 years.
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Manufacturers of Carbon, Alloy and Yoloy Steel

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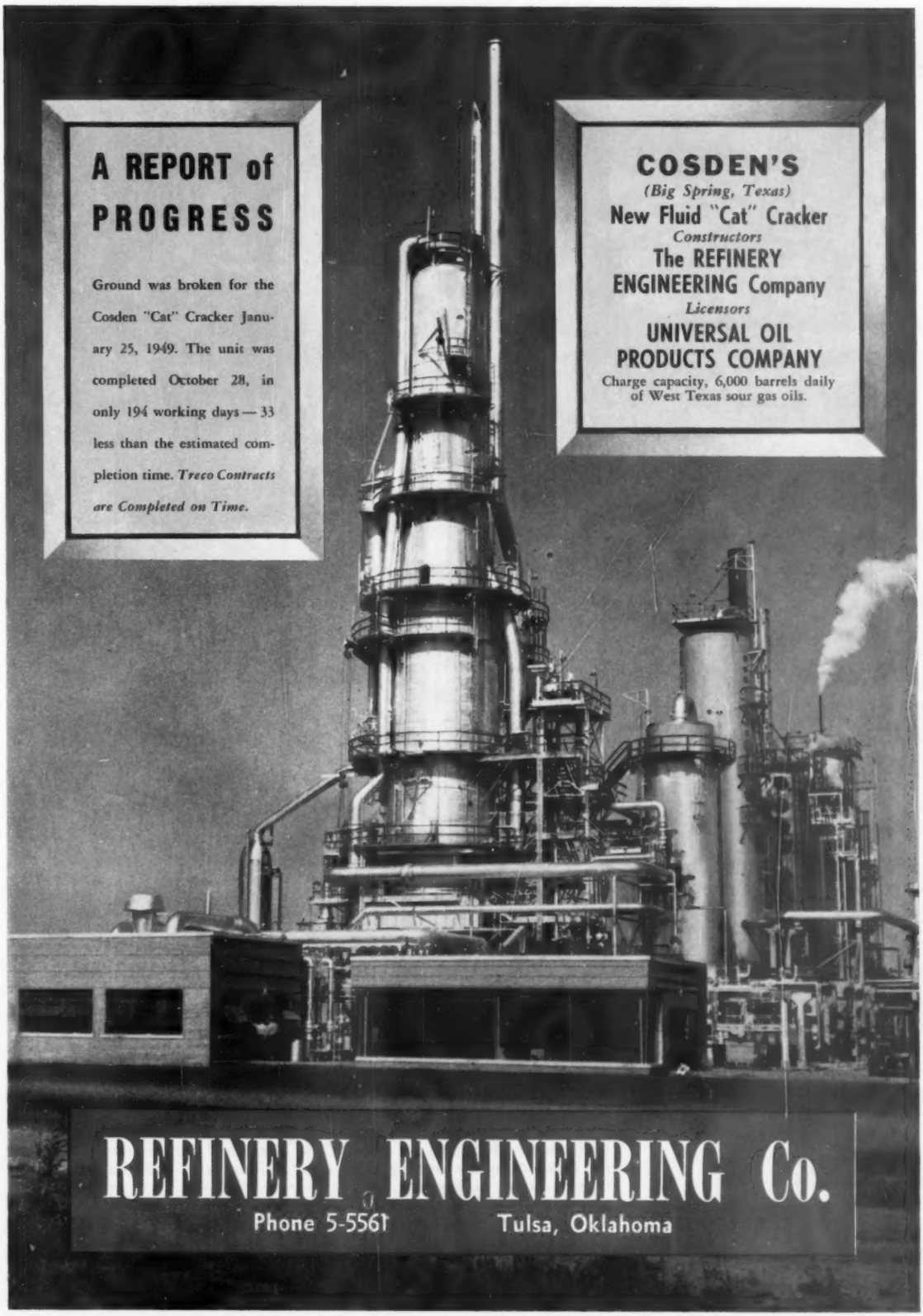
A REPORT of PROGRESS
Ground was broken for the Cosden "Cat" Cracker January 25, 1949. The unit was completed October 28, in only 194 working days — 33 less than the estimated completion time. Treco Contracts are Completed on Time.
COSDEN'S
(Big Spring, Texas)
New Fluid "Cat" Cracker
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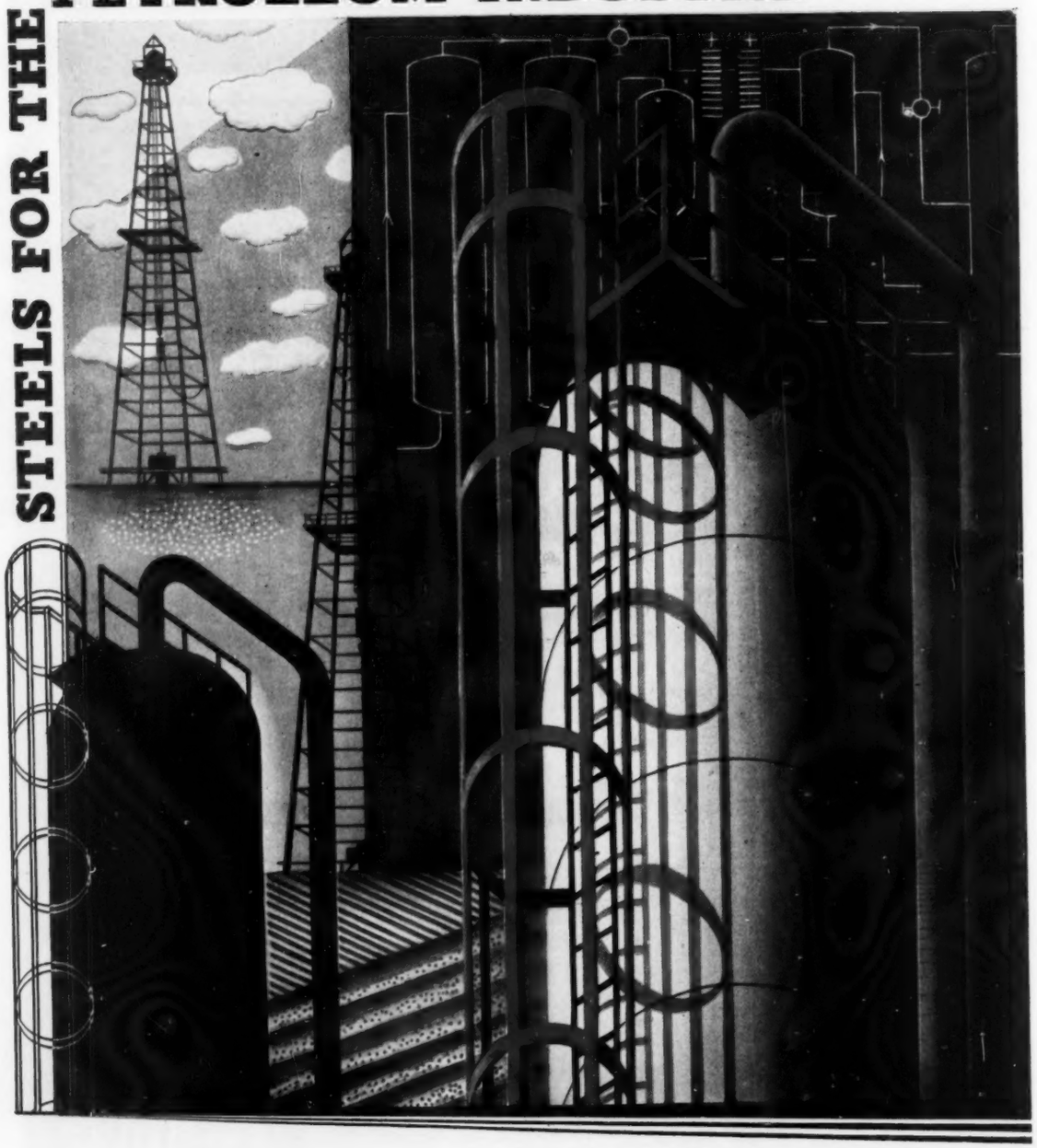
Charge capacity, 6,000 barrels daily of West Texas sour gas oils.
REFINERY ENGINEERING Co.
Phone 5-5561 Tulsa, Oklahoma

STEELS FOR THE PETROLEUM INDUSTRY



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This organisation has made a special study of steel requirements of the petroleum industry: plates for fusion welded vessels; constructional steel; forgings; alloy steels, including corrosion and heat-resisting types; etc. The Technical Departments will be pleased to discuss specific applications with manufacturers of petroleum equipment.

THE UNITED STEEL COMPANIES LIMITED

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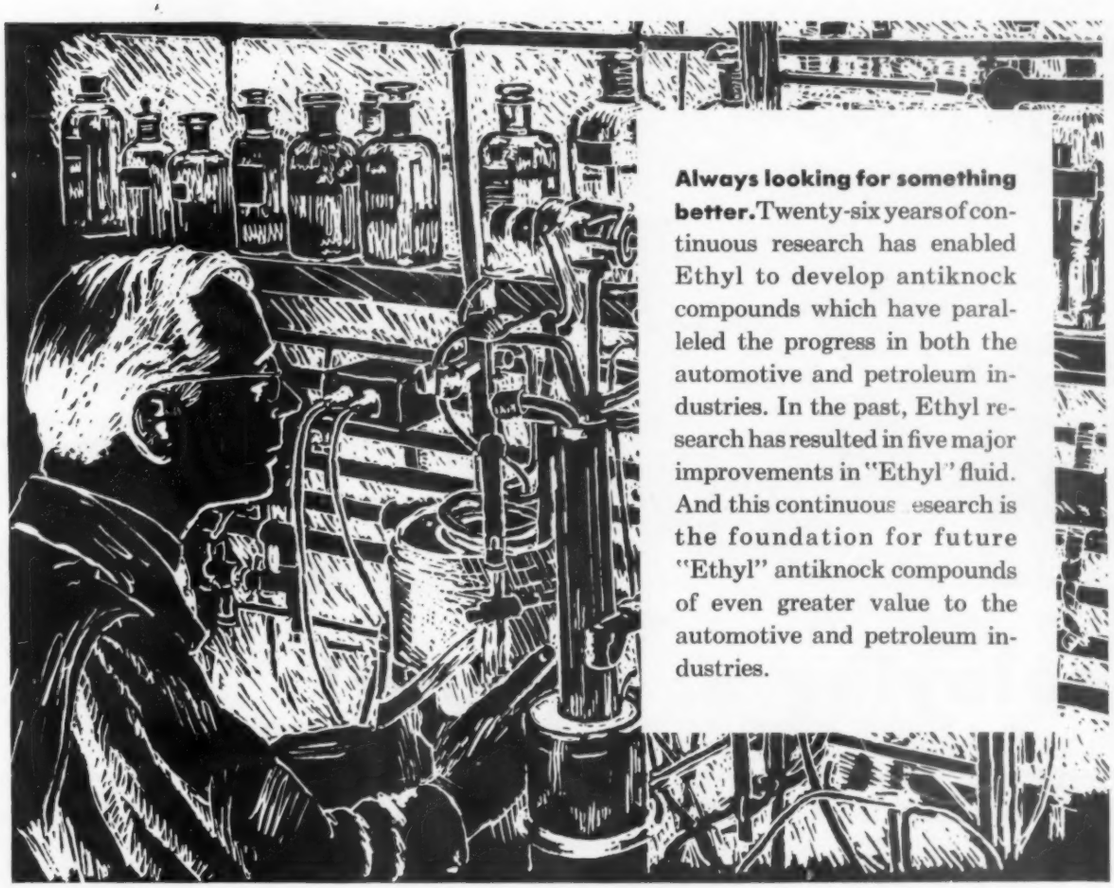
E 26* is the foundation for tomorrow's antiknock compounds



Always looking for something better. Twenty-six years of continuous research has enabled Ethyl to develop antiknock compounds which have paralleled the progress in both the automotive and petroleum industries. In the past, Ethyl research has resulted in five major improvements in "Ethyl" fluid. And this continuous research is the foundation for future "Ethyl" antiknock compounds of even greater value to the automotive and petroleum industries.

E 26 is Ethyl's twenty-six years of experience in providing a complete antiknock service.

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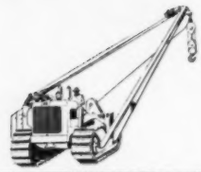
INTERNATIONAL INDUSTRIAL POWER



AND ALLIED EQUIPMENT

This International TD-24 Diesel equipped with Superior Pipe Boom has a maximum lifting capacity on firm level surface of 79,000 pounds—greatest in the field!

Pipelaying at a profit!

An International TD-24 Diesel Crawler with a Superior Pipe Boom—that's the combination for fast, economical pipelaying!

This giant International Diesel has the weight and power to cover the roughest terrain. When teamed up with the new Superior Pipe Boom it handles the biggest pipe with ease and precision. Here are some other features that pay performance dividends: Low center of gravity gives you the greatest lifting capacity in the pipe boom field; Low frame-mounting insures full, unobstructed operator vision; Automatic boom clutch throw-out prevents bending of boom or main frame; Readily accessible levers mean absolute control at all times.

Your International Industrial Power Distributor can supply you with the International Diesel and Superior Pipe Boom combination in the capacity you want. Others include the International TD-9 and boom which handles up to 12,300 lbs.; TD-14, up to 21,600 lbs.; TD-18, up to 28,700 lbs.

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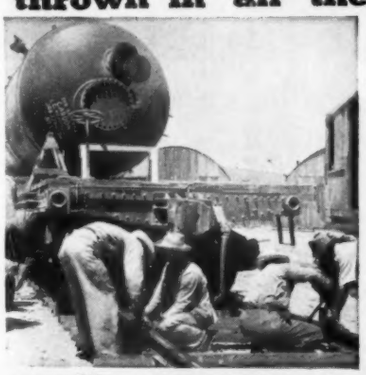
POWER UNITS

Released from the production of War material many far-seeing Engineering Firms have joined in the race to meet the urgent call of Oil producers

The land is cleared

The site is chosen

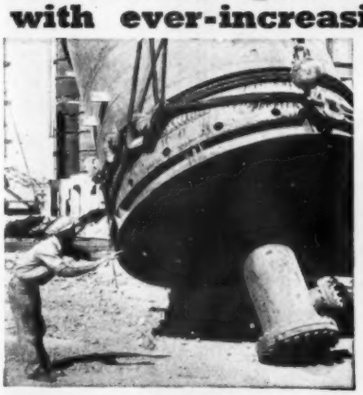
for Plant and yet more Plant. In this country, Harveys of London have thrown in all their vast resources of men, material and "know how"



A railway is built

A column arrives

and have so geared production that they are meeting this huge demand with ever-increasing results which will bring benefit to millions.



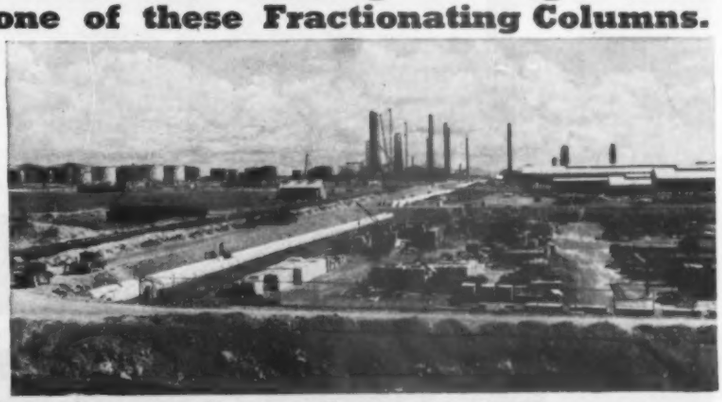
Off loaded on site

It is gently raised

And so we see, stage by stage, from the clearing of virgin land to the final erection, a history of one of these Fractionating Columns.

and lowered into position

to start immediate production



Necessarily, this pictorial explanation is much condensed, but even so, it clearly evidences another triumph of British Engineering enterprise.

From the Shell Library come these scenes from various stages in the production and transport of one of these huge Fractionating columns.

Harvey

G.A. Harvey & Co. (London) Ltd. Woolwich Road, London, S.E.7

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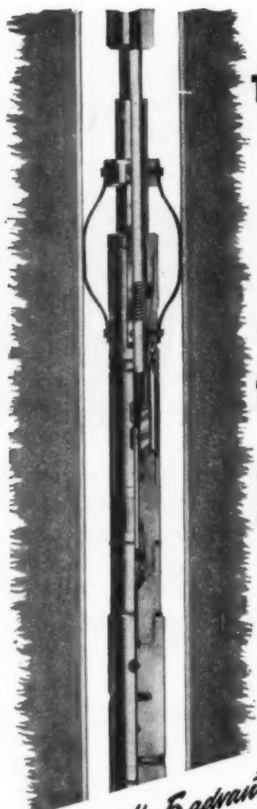


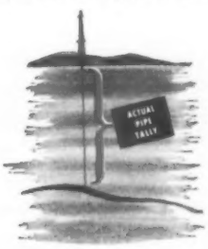
The JOHNSTON SHOOT-N-TEST GUN PERFORATOR

Combines 5 Outstanding Features for better gun perforating operation!

By selecting a Johnston Gun Perforator you get years-ahead Gun Perforator design for an easier, more economical method of perforating casing. In addition, this Gun Perforator serves as the perforating unit in *combined* "Shoot-n-Test" operations for the slickest possible way of obtaining water shut-off information, doing exploratory work or testing for actual production.

Check the 5 advantages check and then compare before you buy any Gun Perforator equipment!

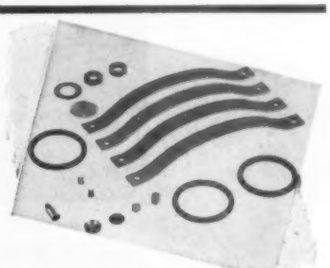
1 Safer Operating . . . because the Johnston Gun Perforator fires only when subjected to *both* in-the-hole hydrostatic pressure and definite top-hole pipe manipulation. You get safety in transporting and rig-floor handling and positive protection against premature firing on the run-in.



2 More Exact Positioning . . . because the Johnston Gun Perforator is tallied in on your own tubing or drill string – no guess work, no elaborate measuring devices . . . you connect the Gun Perforator on the bottom joint of pipe and run-in until actual pipe-in-the-hole tally spots unit opposite the formation to be perforated.

3 Simultaneous Fire of ALL Projectiles . . . because of the hydrostatic firing principle of the firing head and flash hole design of each perforating gun section, the firing of all chambers is virtually instantaneous and all projectiles are projected simultaneously . . . an important feature because *balanced* recoil increases penetration depth and assures proper spacing of perforations.

4 Field Car Portability . . . because the firing head, together with the number of perforating gun body sections selected for any particular perforating job can be easily transported in the back of a regular pick-up truck or field car. *After* arriving at the well location, the Gun Perforator can be assembled with standard hand tools.



5 Faster, Easier Maintenance . . . because of the minimum number of working parts in the firing head and the *few* expendable supplies required after each job. All expended supplies are easily replaced during normal reassembly after cleaning and drying the firing head and perforating gun sections.

WRITE today for descriptive literature!

SHOOT-N-TEST Trademark FORMATION AND CASING TESTING

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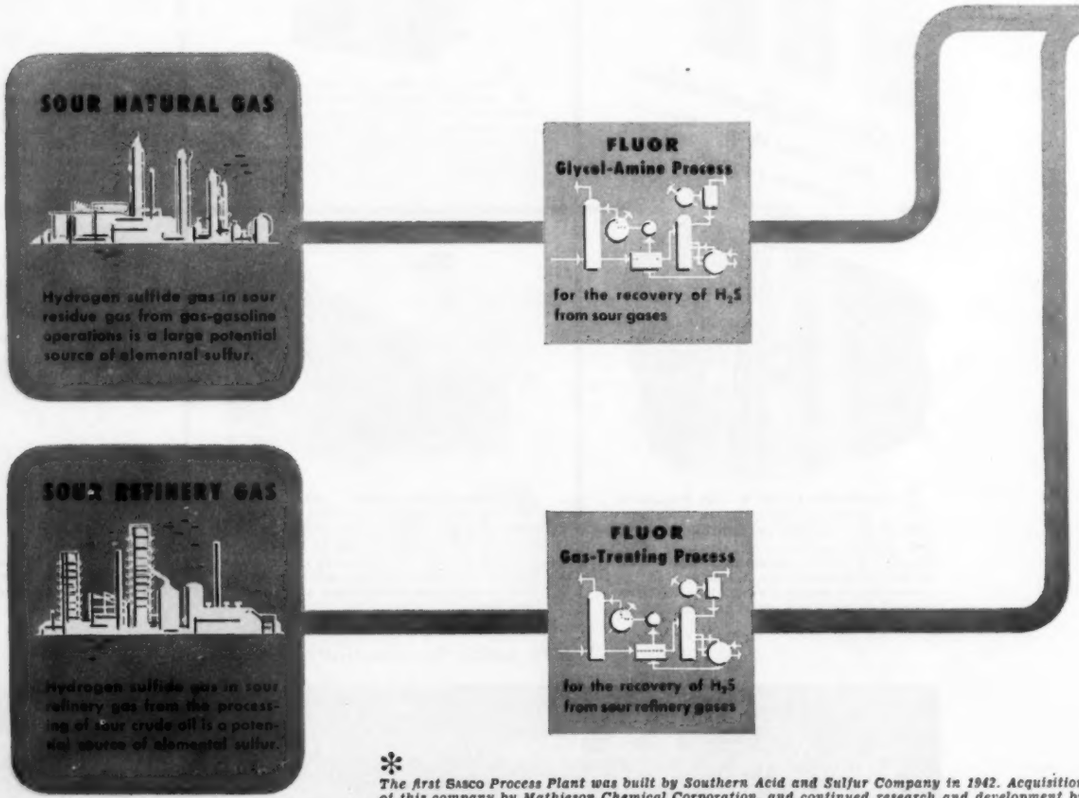
SOUR NATURAL GAS
Hydrogen sulfide gas in sour residue gas from gas-gasoline operations is a large potential source of elemental sulfur.
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for the recovery of H_2S from sour gases
SOUR REFINERY GAS
Hydrogen sulfide gas in sour refinery gas from the processing of sour crude oil is a potential source of elemental sulfur.
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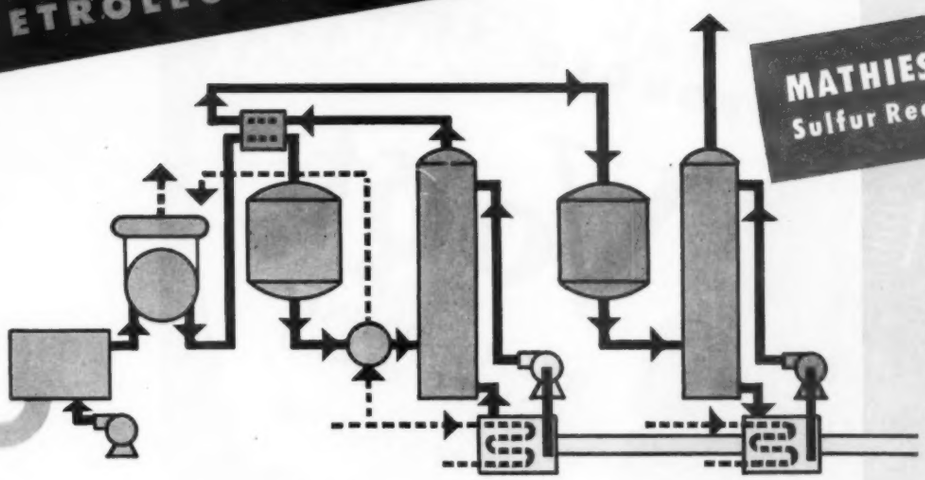
Gas-Treating Process
for the recovery of H_2S from sour refinery gases

* *The first Sasco Process Plant was built by Southern Acid and Sulfur Company in 1942. Acquisition of this company by Mathieson Chemical Corporation, and continued research and development by Mathieson personnel mark this process for recovery of sulfur from waste hydrogen sulfide gas as the only one developed in the United States with a record of several years' successful operation.*

R RECOVERY
UR PETROLEUM GASES

MATHIESON-SASCO
Sulfur Recovery Process



MATHIESON-SASCO PROCESS

A gas stream containing hydrogen sulfide gas, such as the acid gas effluent from an amine plant, is partially burned with air—the heat being utilized for steam production. The combustion gases are passed through a catalyst where SO_2 and H_2S react to form sulfur and water vapor. Elemental sulfur is then recovered from the gas stream by contacting with liquid sulfur in wash towers. The residue gas containing nitrogen, carbon dioxide and water vapor is vented to the atmosphere.

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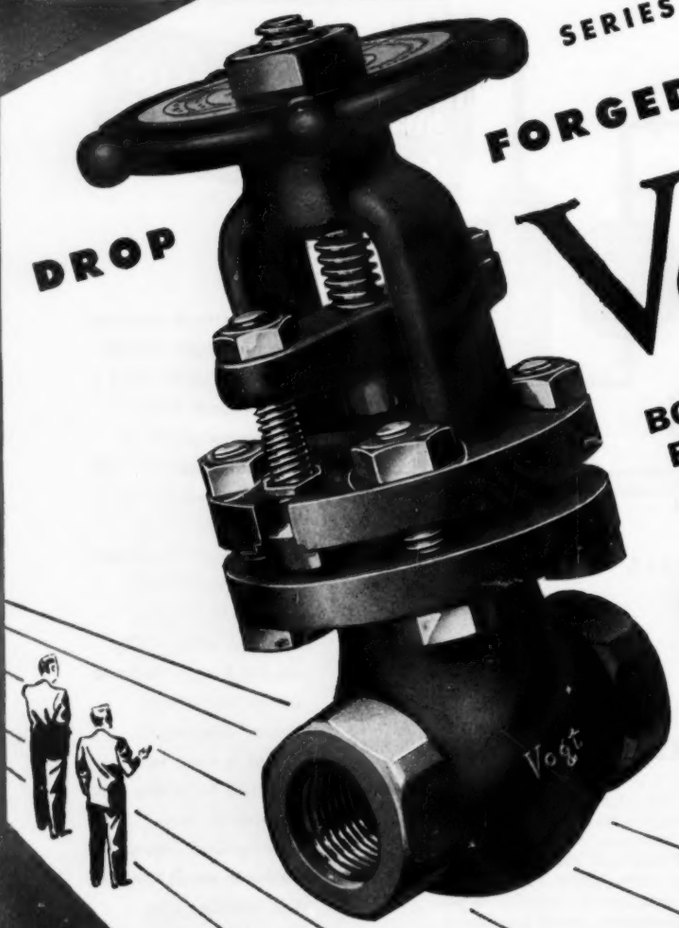

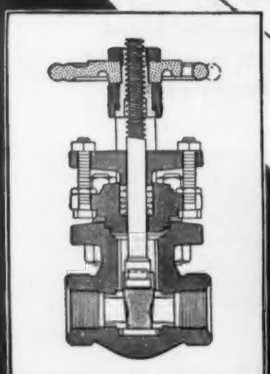

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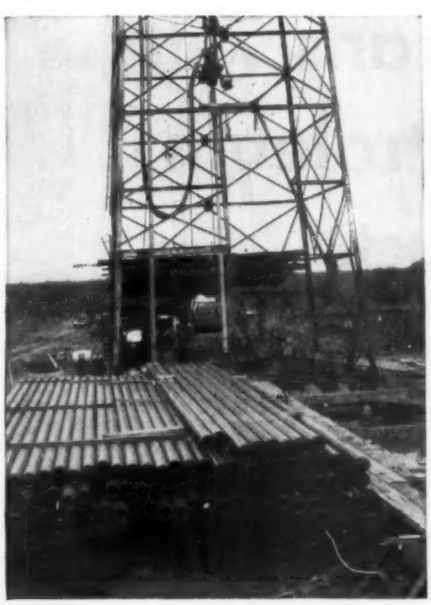

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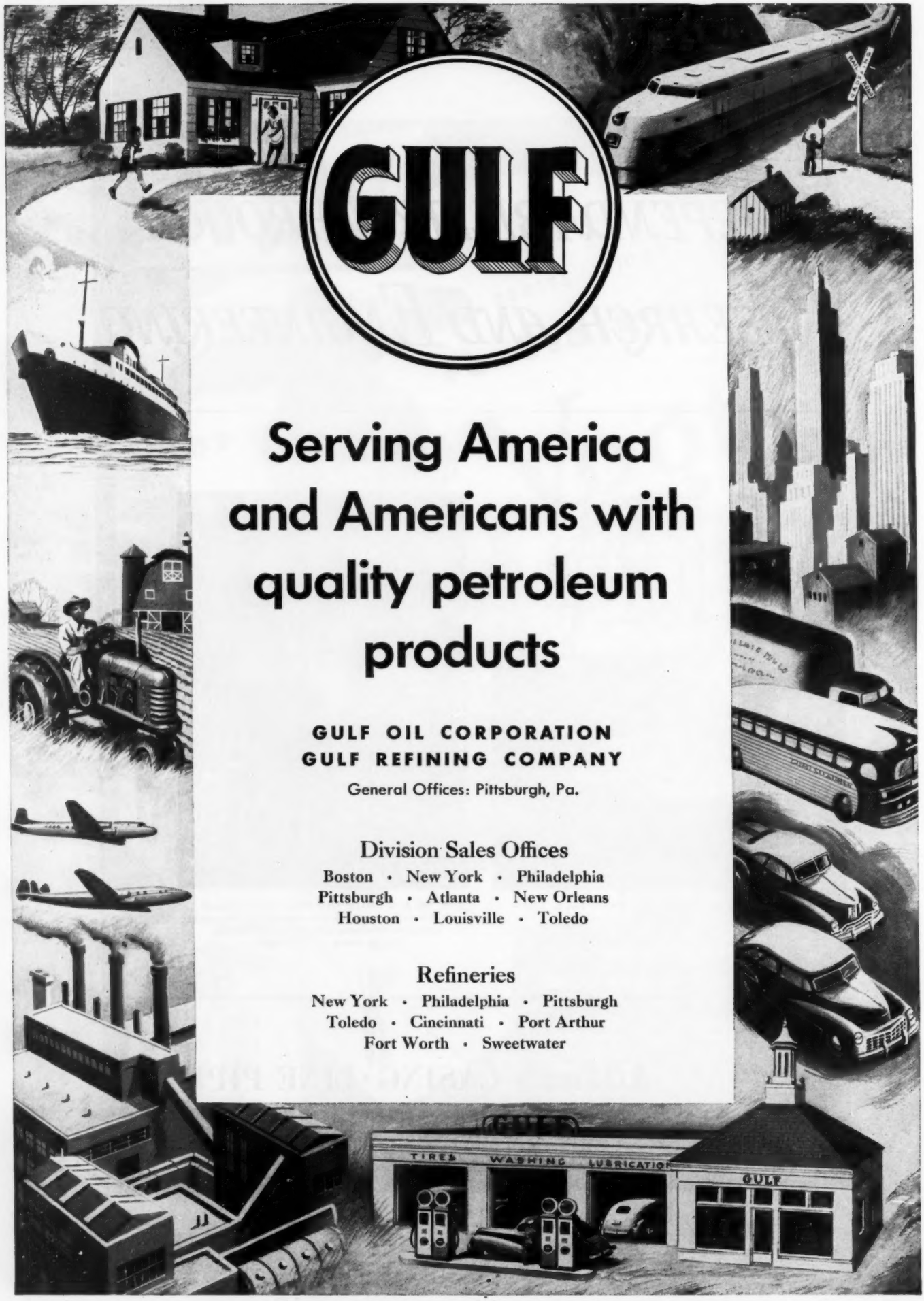
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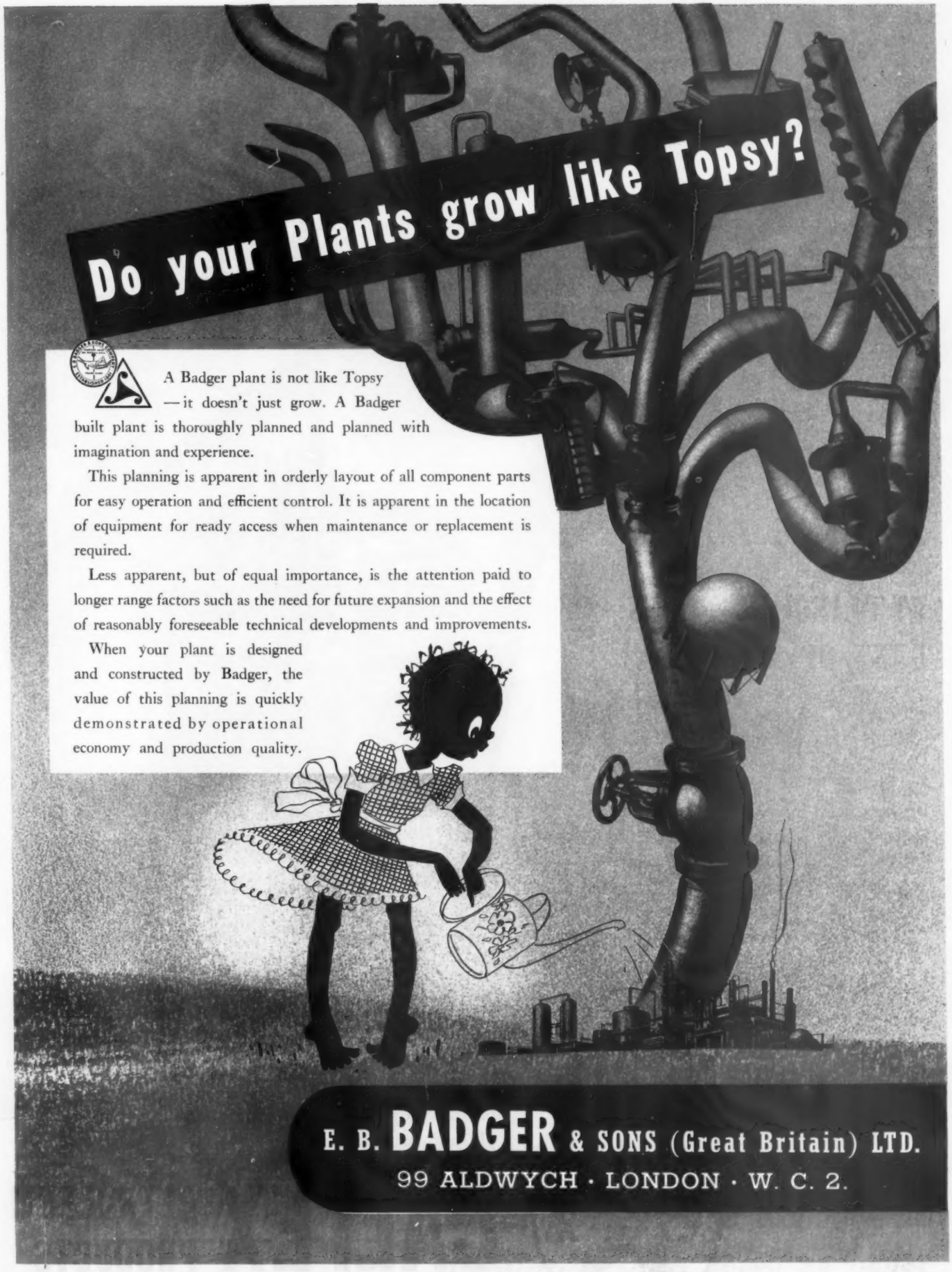
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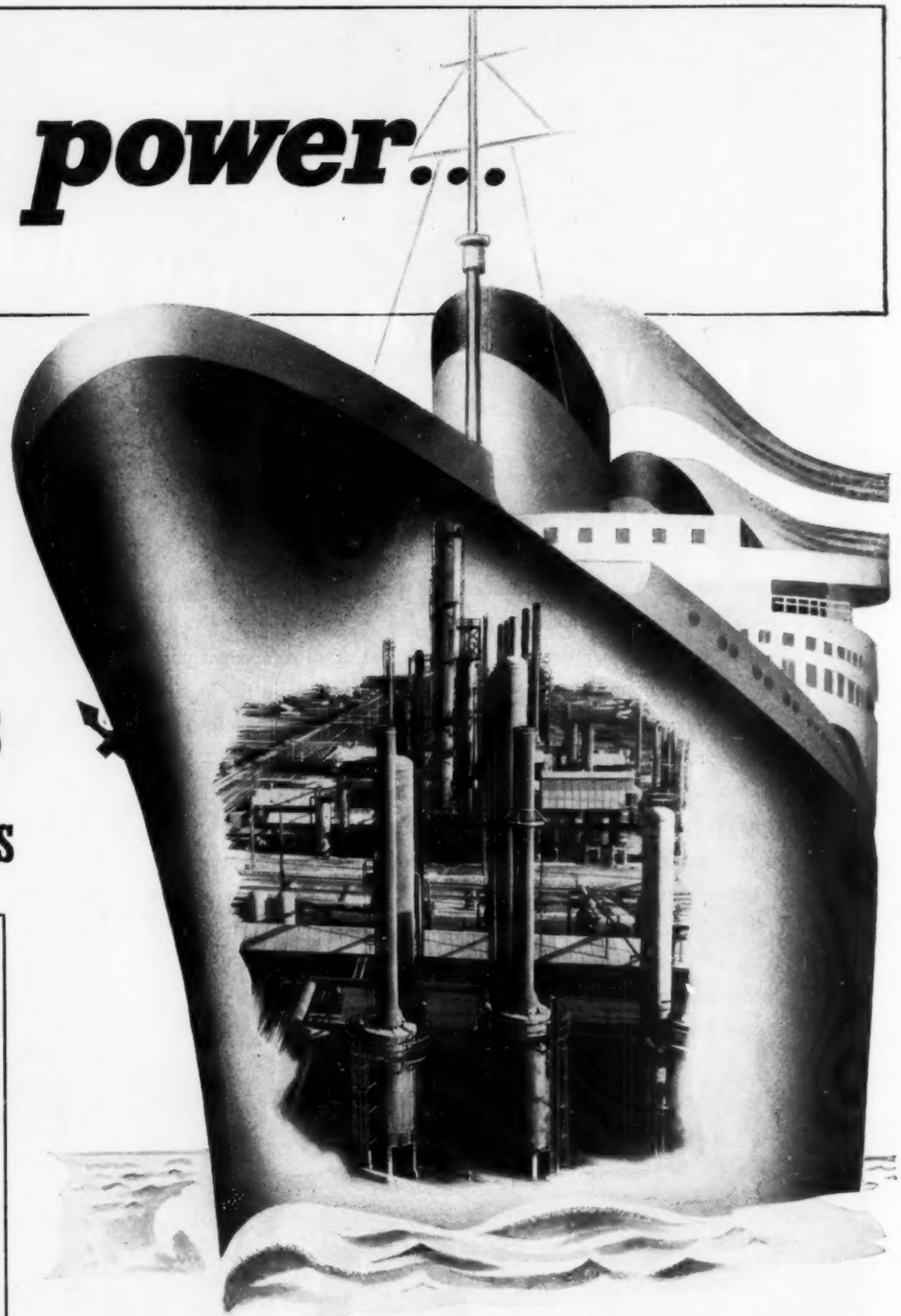

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- Continental Oil Co.
- Esso Standard Oil Co.
- Imperial Oil Limited
- Magnolia Petroleum Co.
- National Petroleum Council of Brazil
- Pan American Refining Corporation
- Societe Generale des Huiles de Petrole
- Societe Industrielle Belge des Petroles
- Socony-Vacuum Oil Co.
- Standard Oil Company (Indiana)
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KELLOGG built its first atmospheric distillation unit more than a quarter century ago — when many of the primary distillation facilities of other types were already in existence. Yet since that date Kellogg units have been installed on five continents in more than fifty different locations.

The applications have ranged from virtual skimming in Palestine where more than half of the crude was returned to ground reservoirs to the accurate fractionation of Pennsylvania crude.

They've been designed as independent units and in combination with decarbonizing, coking, cracking, vacuum distillation, visbreaking and reforming. Individual capacities have ranged from 1,000 to over 40,000 BPD.

In a phase of oil processing such as this, where building contracts are customarily open to practically any bidder, there must be definite reasons for *the record concentration in one company's hands* of contracts for more than a million barrels of capacity.

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Along these lines, the Lucite bubble tower (shown here) continues to operate in the Kellogg Engineering Laboratories, permitting engineers to carry on investigation of the problems of "Fluidynamics" — cap spacing, types of trays, dumping, entrainment and a host of other details.

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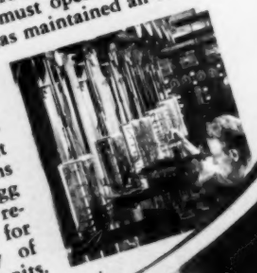
both equipment and people — to improve processing and equipment ideas. Most refiners know of Kellogg's extensive pilot plant and chemical laboratories — know the professional reputations of the men who guide their activities. But processes are only as good as the equipment within which they must operate. That is why, over the years, Kellogg has maintained an extensive Metallurgical Research and Development operation. Materials, fabrication methods and new types of equipment are its permanent projects. The contributions of this group to the Kellogg organization have been responsible in a major way for the superior efficiency of Kellogg refinery units.



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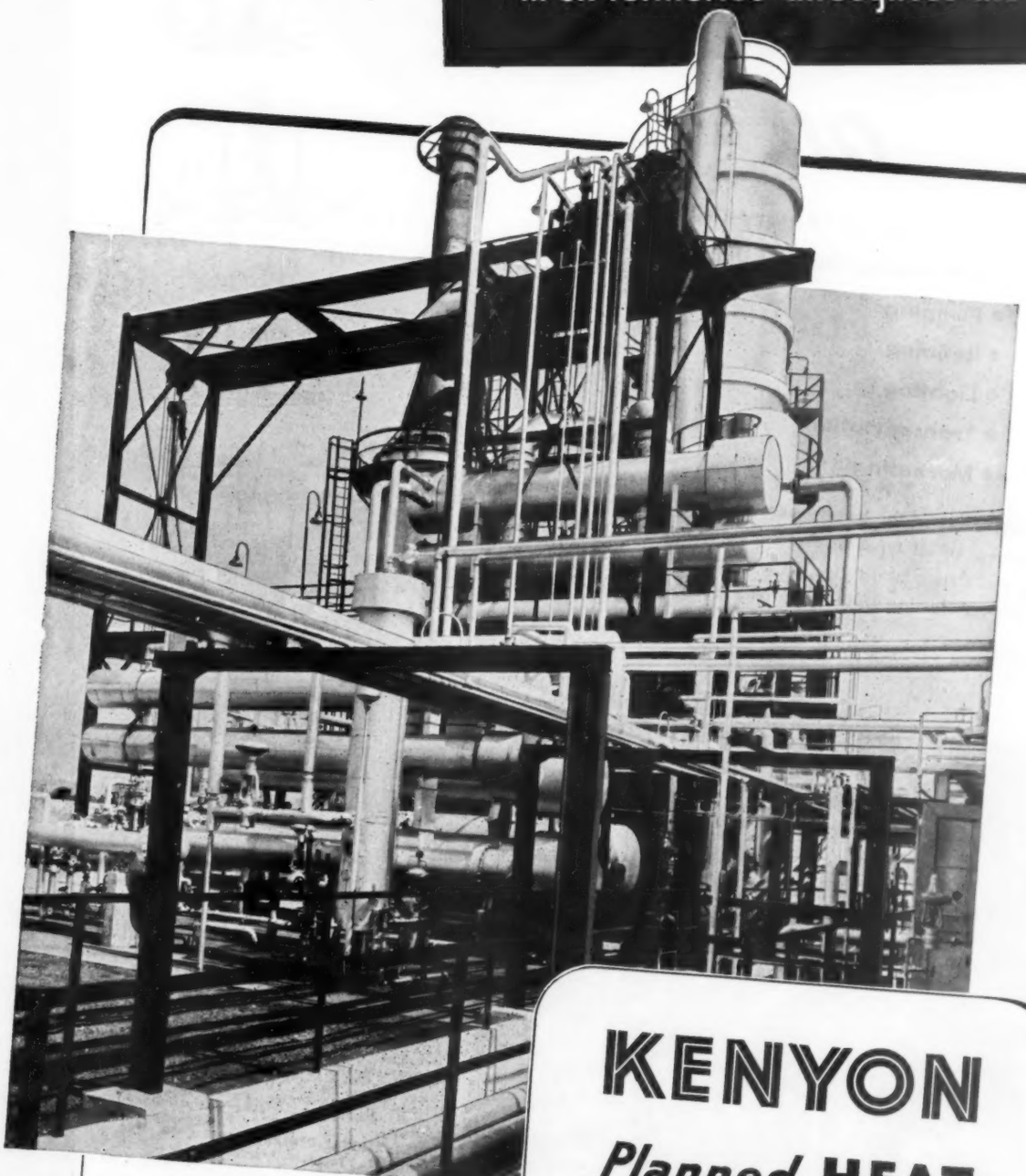

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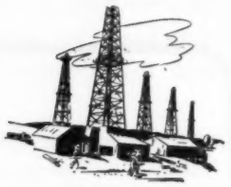

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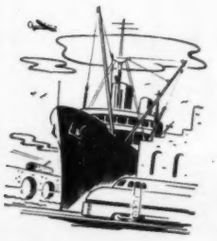

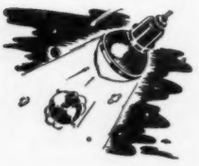

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This Month's Cover

This photograph of a well being drilled on the plains of West Texas was taken by Wendell MacRae and is reproduced here through the courtesy of The Texas Company.

World Petroleum Index

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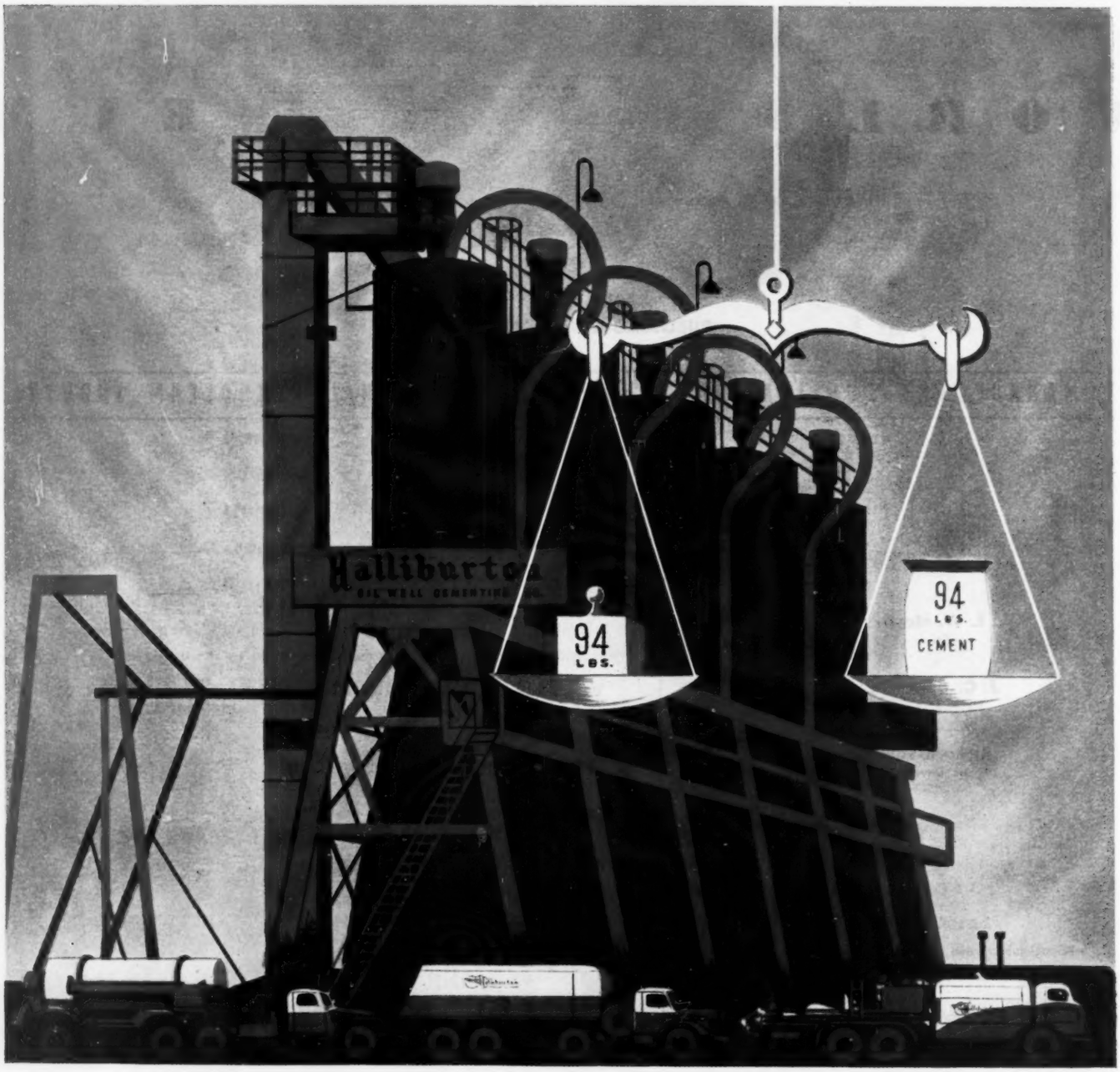

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EDITORIAL

OIL INDUSTRY ENTERS YEAR OF BROADENING ACTIVITY

A CROSS section of opinion among oil men and in the closely related oil equipment industry discloses a high measure of optimism as to the business outlook for 1950. This prevails both in the United States and in the international field. It is no cloistered conclusion but is based on the solid evidence of plans approved and orders booked. A year ago, with stocks at the highest levels of recent years and with forewarnings of a general business recession that might cut demand drastically, there was apprehension as to a serious disruption of the industry and a reversal of its historical steady advance.

The record of 1949, now completed, shows that none of these catastrophic results has followed. Instead of a fifty-percent decline in exploration and drilling, the number of wells put down is close to the figure for the preceding year, while the total footage drilled and the number of exploratory tests are substantially larger. Consumption of petroleum products has continued to grow and the volume of known reserves continues to rise. The headlong pace of the early postwar years has moderated; there have been some reductions in prices, but such readjustments as have been necessary have taken place without serious impairment of market stability.

Acting on the sound assumption that the demand for oil products will continue to increase, as it has throughout the past ninety years, and that constant effort is needed to insure a supply adequate for national security and for the satisfaction of consumer requirements, increased emphasis is being placed on the search for oil despite prophecies in some quarters of an approaching oversupply. A number of the larger American companies that have greatly extended their refining facilities during the past year or two are now putting special stress on enlargement of their crude supplies. One such company has announced an appropriation of $150 million to be expended in the next three years in finding more crude. Another has doubled the number of its geophysical crews and is spending over $20 million on exploratory drilling during the season now beginning. These are but random examples of a trend that is becoming more and more widespread.

One of the busiest segments of the oil industry during the year now beginning will be the prairie provinces of Canada where successive discoveries during the past two years have provided convincing evidence that the region contains one of the richest of the world's oil deposits. A veritable oil rush has resulted, bringing into the field representatives of companies large and small, and starting a campaign of leasing and exploration over an area larger than the state of Texas.

In other parts of the western hemisphere exploratory activities are rising to a new tempo. The military government of Venezuela has announced that it will begin issuing concessions to waiting applicants for the first time since it assumed power. Argentina recently has placed orders for large quantities of geophysical equipment for use in its field surveys. Peru, Brazil and Colombia all are considering changes in their laws with a view to attracting outside capital to the development of their petroleum resources.

European nations such as France, Italy, Spain and Turkey that never have figured to an important extent as producers are actively pursuing the search for petroleum within their borders; preliminary exploration is being extended to large areas in Africa; development of the huge fields of the Middle East is going forward steadily, and in the Far East the restoration of war-damaged fields and expansion into new districts are responsible for large-scale programs of drilling and exploration that have not been approached since prewar years.

Although the past two years witnessed an expansion of refining facilities without peacetime precedent, evidence at hand indicates that 1950 will continue the pace without abatement. Reports from engineering firms and contractors are that the number of orders in hand equals and in some few cases exceeds previous records, while the volume of inquiries received outruns past experience.

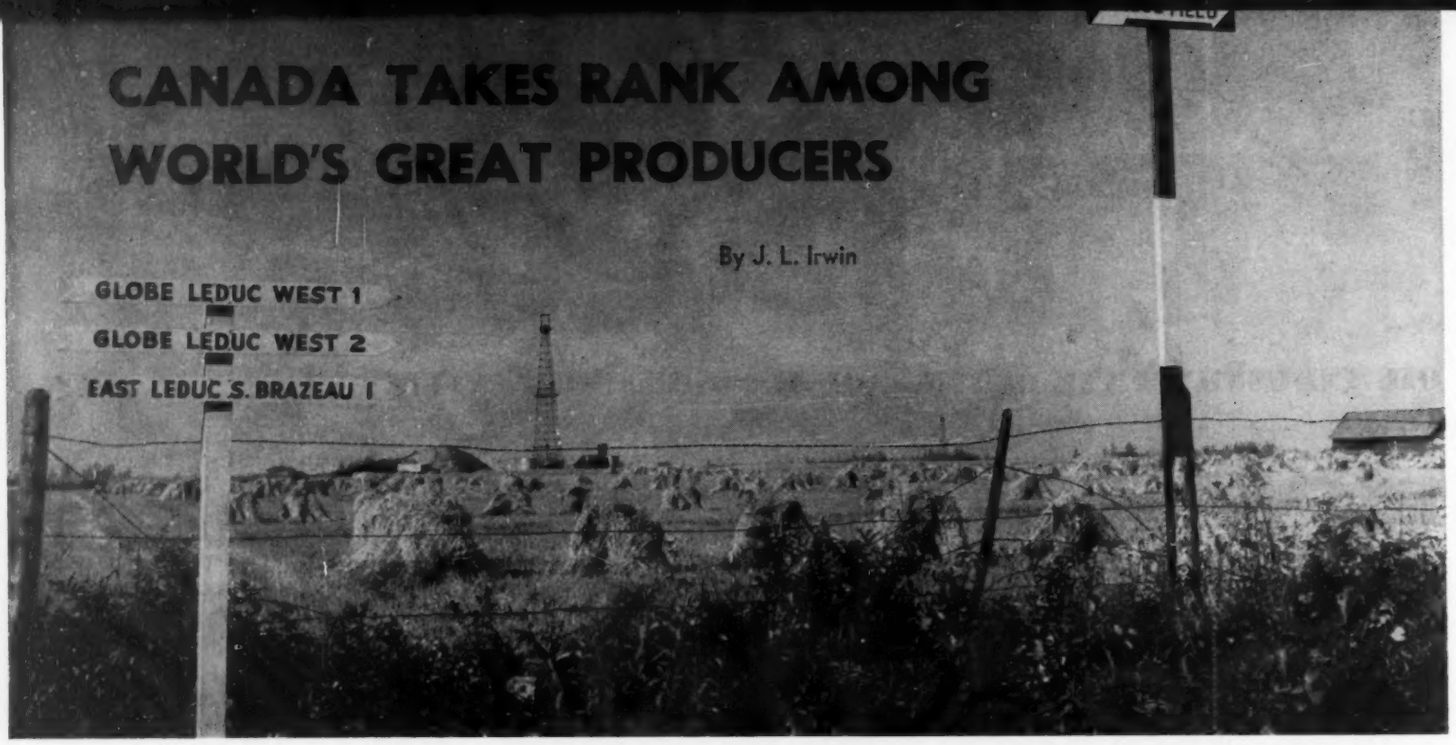
Meanwhile the countries of western Europe are engaged in a program of refinery construction that is counted upon to more than double throughput capacity by 1952 or 1953.

Pipeline construction is moving ahead at a rate that undoubtedly will set a new high record during the coming year. Tank car companies report that demands upon them are close to the wartime high and the movement of oil by deep-sea and coastwise tankers, which had been to some extent in the doldrums during the earlier part of the past year, took on renewed activity during the final quarter, and chartering activity led to a ten percent advance in rates, an augury of expanded operations during the year now beginning.

The oil industry is never without its problems, but it enters 1950 with every assurance that it faces a season of great activity and a sustained advance in its never-ending progress in the service of mankind.

CANADA TAKES RANK AMONG WORLD'S GREAT PRODUCERS

By J. L. Irwin



AFTER many years of search for oil with relatively meagre results, western Canada, within the past two years, has zoomed into a place of outstanding importance in the world oil picture and is today the scene of as intensive exploration and drilling activity as is to be found in any part of the globe; this in spite of the fact that there is no adequate outlet for the oil already in sight nor will there be until pipelines giving access to outside markets can be built.

In the first ten months of 1949 Alberta produced 16,732,421 barrels of crude and natural gasoline. This is an increase of 5,758,583 barrels over the production for the whole of the preceding year (10,973,583 barrels) which was Alberta's record up to that time. This indicates a total for the past year of around 20 million barrels with production heavily restricted below the normal allowable fraction of well potentials.

A visiting oil company official from the United States remarked recently that the oil boom in Canada has not really started and will not get under full headway until the pipeline is finished to Lake Superior. The prevailing opinion among Canadian geologists is that Alberta's oil reserves, as established at present, represent only a fraction of the quantity yet to be discovered over a huge area of most promising territory. Present potential of known reserves is placed at about one and a half billion barrels.

With reference to natural gas, the estimated potential is now given at six trillion cubic feet, as compared with four and a quarter trillion a year ago. From present knowledge and allowing for increased demands for this product as the province expands, Alberta has sufficient natural gas for home consumption for the next 100 years and already has a surplus for shipment to other Canadian provinces and to the United States.

The Leduc gas conservation plant has been constructed by Imperial Oil Ltd. at a cost of $5 million with a view to eliminating present gas flares. Three liquid byproducts will be recovered in the process—casinghead gasoline, propane and butane. Approximately 90 percent of the plant feed will be available for sale as dry gas.

This adds still another phase to the natural gas situation. As time goes on, plants in other fields may follow suit in this respect, byproducts being recovered and the residue being transported by pipeline as dry gas for fuel. Benefits to be secured by this development will come also to the oil operator, who in drilling for oil but finding gas, will have a market for the latter.

The government of Alberta is an outstanding beneficiary from the present intensive oil program. The first six months of 1949 show the biggest surplus ever recorded in the history of the province, the major portion coming from oil and gas. Fees, rentals, royalties and purchase price for leases in this six months' period totalled $15,036,956. This is an advance of $12,644,901 over the amount received from the same source in the corresponding period of 1948. Of the $15,036,956 oil revenue, $10,233,501 came from the sale of petroleum and natural gas leases. Within a recent period bonuses from crown lands alone have reached a cumulative total of around $20 million. Future revenues in such bonuses, plus royalties during life production, eventually will run into hundreds of millions of dollars.

During the latter part of 1949 western Canada moved up to second place among oil countries of the world in geophysical survey work. The expenditure on exploration in the prairie provinces is now stated as being in excess of one and one half million dollars per month.

The latest compilation of active geophysical parties shows a total of 101, which included 72 seismograph units. The cost of operation per crew varies from $15,000 to $25,000 per month, depending on the terrain under exploration.

Charting the subsurface by measurement of gravity variations is being carried out by 27 gravity meter crews. With one exception, these are ground crews with costs from $3,500 to $5,000 per month for each party. In northeastern Alberta the one exception is mounted on a helicopter. This facilitates the survey of remote areas without roads. Costs for this aerial party are about four times that of a ground crew.

Two parties deal with magnetometer work charting buried rock masses by magnetic attraction. One is a ground crew and the other, surveying a large area in southern Saskatchewan, is mounted on an aeroplane.

Much the greater part of this special work is being carried on in Alberta with 68 seismograph and nine gravity meter crews. A marked increase in geophysical work has taken place in Saskatchewan where the number of crews has increased within a few months from six to 22. These include two seismograph, 18 gravity meter and two magnetometer groups. Manitoba has two seismograph parties working.

The area of western Canada being thus surveyed covers around a hundred million acres, about half of the favorably considered oil territory of Alberta, a large part of Saskatchewan and areas in Manitoba and British Columbia.

An interesting comparison in western Canada's survey work may be made with that of Texas, which is the only part of the world in this respect to exceed western Canada. Comparing with the Canadian 101 parties, Texas has 173. Louisiana takes third place with 79. Others in the states are Wyoming, 50; Oklahoma, 43; Missis-

sippi, 35; Montana and California, 21 each. Crews in the United States recently totaled 492.

The Canadian crews are under the supervision of thirty concerns. Seven are oil companies, six are Canadian contractors, and the remainder have their headquarters in the United States. Imperial Oil heads the list with 11 parties; 10 seismograph and one gravity meter. McColl-Frontenac and Texaco Exploration combined operate nine crews, eight seismic and one gravity; Socony-Vacuum has seven, five seismic and two gravity; California Standard has five seismograph crews in Alberta and two in southwest Manitoba.

Shell Oil of Canada, recently became active again in the west, has six crews, four seismic in Alberta and one seismic and one gravity in Saskatchewan; Amerada Petroleum has five seismic crews operating for that company and one working jointly with Hudson's Bay Oil and Gas, all in Alberta; Canadian Gulf has three seismic and two gravity crews; Stanolind Oil and Gas, five seismic; Pacific Petroleums, Bear Oil and Associates, five seismic; Sohio Petroleum and Associates, five gravity in Saskatchewan; Western Prairie Exploration, unit of Woodley Petroleums of Texas, one seismic in Alberta and four gravity in Saskatchewan.

Husky Oil and Refining and Phillips Petroleum combined have one seismic crew in Alberta, two gravity and one magnetometer in Saskatchewan; Barnsdall-Honolulu-Seaboard, three seismic and one gravity; Rio Bravo Oil, unit of Superior of California, two seismic and one gravity; British American Oil, two seismic working for the company and one jointly with Hudson's Bay Oil and Gas; Hudson's Bay Oil and Gas, 2½ units in Alberta which include one seismic crew of its own and single units acting jointly for Amerada, British American and Union Oil of California.

Benedum and Trees have one seismic crew and one gravity mounted on helicopter; Royalite Oil has one seismic and one gravity crew in Saskatchewan; Battleford Petroleums has two gravity in Saskatchewan; Albercan Oil and Pantepec Oil combined have two gravity units in Saskatchewan; Tidewater Associated Oil group has one airborne magnetometer unit in Saskatchewan. An independent operator, Edward Roos, has one gravity meter party in Saskatchewan. Single seismic crews in Alberta are being operated by Pacific Western, Sun, Cities Service and Ohio Oil.

Imperial Oil Company spent $23 million in search of new fields without success until Leduc was discovered in February 1947. In 1947 the company spent $10 million in exploration and development; in 1948, $30 million, and the figures for 1949 and 1950 will be about the same, $30 million for each year.

With the enormous development program of the company's many branches, special financing has been undertaken to carry out its activities. This has included the sale of profitable subsidiary companies and the floating of a fifty million dollar debenture issue. Also included is the farming out of some of its holdings to other companies, mostly independent companies in the province, so that financial assistance is obtained and development continued ever more speedily.

Sale of Imperial's subsidiaries during the past year included International Petroleum Co., a large South American producer; Royalite Oil Company, big Turner Valley producer of oil and gas, absorption plant operator and pipeline operator; Foothills Oil and Gas Company, Lowery and Southwest Petroleums, controlled by Foothills, last three being Turner Valley companies.

The Edmonton - Regina - Superior, Wisconsin, pipeline is one of the greatest undertakings in Imperial Oil's immediate program. A summary of the major orders already given for this is as follows: steel plate, to be rolled by Steel Co. of Canada Ltd. at Hamilton and made into pipe by Page-Hersey Tubes Ltd. at Welland, will cost $8 million; diesel engines, Dominion Engineering Co. Ltd., $850,000; pumps, Canada Iron Foundries, Ltd., $100,000; speed increasers, Dominion Engineering, $105,000; waste heat boilers and heat exchangers, Foster Wheeler Ltd. at St. Catharines, $107,000; tankage at Edmonton, Horton Steel Works Ltd., $550,000; enamel and priming solution for coating pipe, By-Product Coke Co. of Canada Ltd., $650,000; glass pipe wrap, Fiberglas Canada Ltd., $280,000; asbestos felt wrapping, Canadian Johns Manville Ltd. and Philip Carey Co. Ltd., $350,000. These orders have all been placed in Canada.

Chief contractors for the laying of the pipe number three, but several subcontractors will be required to complete the job on time. Wherever possible, subcontracts will be let locally. Ten spreads of equipment will be in use at one time along the route, each equipment spread representing an investment by the contractor of about three quarters of a million dollars. Prime contracts for the laying of pipe have been given as follows: Edmonton to Regina, Canadian Bechtel Co., associated with Fred Mannix of Calgary; Regina to Gretna, Manitoba, Williams Brothers, who laid part of the Montreal-Portland pipeline and have built large gas lines in Alberta; Gretna to Superior, Wisc., Anderson Brothers.

Surveying and staking of the route is being done by Underwood and McLellan of Saskatoon; aerial photos by Photographic Survey Co. Ltd. of Toronto; excavating and grading at Edmonton by Doncaster Construction Co. of Edmonton; grading, surfacing and other preparatory work for the pump station at Ermine, Bird Construction Co. Ltd. of Winnipeg. Total cost of laying the line, excluding materials, is roughly $14.7 million. Many contracts for construction and supplies are still to be let.

Another major expenditure during the next two years will be expansion of western oil refineries. Present capacity is 67,000 barrels per day, 35,000 in Alberta and 32,000 in Saskatchewan and Manitoba. These are to be expanded to a total of 90,000 barrels daily, 42,000 in Alberta and 48,000 in Saskatchewan and Manitoba.

To bring western crude oil to eastern Canada from lakehead at Superior, two oil tankers, the largest ever to be built in Canadian shipyards, are to be constructed for Imperial Oil by the Port Arthur Shipbuilding Co. Ltd. and Collingwood Shipyards Ltd. at a combined cost of $7.8 million. They will have a length of 620 feet with a beam of 68 feet, a speed of 13 knots and a carrying capacity of 115,000 barrels each, and are to be completed in 1951.

Royalite Oil Company Ltd., now divorced from Imperial and one of Alberta's most powerful independent companies, has now 20 producing wells in the prolific Redwater field close to Edmonton. Following the receipt of seismograph data on the Monitor reservation, the first drilling site was established and the well started. A structure drilling program on the company's 600,000-acre tract at Grimshaw in the Peace River area is progressing satisfactorily.

The company has acquired a partnership interest in the 40,000-acre reservation held by Anchor Petroleums Ltd., 18 miles southeast of Imperial's discovery well at Normandville, 30 miles south of Peace River town. Seismograph examination of the area is now under way.

Besides the drilling program now started on Graham Island, additional acreage is being acquired on the islands in the channel between British Columbia mainland and Vancouver Island. Central Petroleums and Del Rio companies have a 25 percent interest in this venture.

Central Petroleums also has a varying interest in the large exploratory venture of Benedum and Trees upon their large reservation in the McMurray area, 300 miles north of Edmonton. The first well is drilling near the Christina River.

Leduc may have an important extension to the west of its present production limits. The Ross-Leduc Oil Company has brought in two wells in which production flowed from the D2 zone in the first and the D3 in the second. Both were on an Imperial Oil farm-out quarter section.

Drilling programs change continuously in the growing oil picture of the province in territory not proven, depending, of course, entirely on what is established. This exploratory work, though speculative, is of much importance to the industry for the information which it gives.

Reverting to natural gas, Vermilion Consolidated Oils Ltd., subsidiary to Franco Oils Ltd., in reopening and testing a 12-year-old well about 20 miles south of the town of Vermilion, brought in a gas well of 68 million cubic feet per day, one of the largest natural gas potentials recorded in Canada. The test was made under the supervision of two Conservation Board engineers. The reason for reopening was to meet increased demands.

This serves as just another indication of Alberta's enormous gas reservoir and suggests the vast total which the province's gas potential may reach if exploration is extended on a wide scale.

WORLD PRODUCTION OF CRUDE DOWN 16 MILLION BARRELS IN 1949

Crude production in the Eastern Hemisphere Increased 149 million barrels forcing a cut-back of Western Hemisphere petroleum output of 165 million barrels to compensate for loss of export markets in Europe and Asia

WORLD production of crude oil totaled 3,406 million barrels in 1949 compared with 3,422 million barrels in 1948 according to estimates based on latest reports from all fields. On a daily average basis the decrease was 17,600 barrels to 9,331,600 barrels. In 1948 the average was 9,349,200 barrels daily, an increase of 1,056,700 barrels daily over 1947, which was in turn 769,900 barrels per day higher than in 1946.

In recent years the western hemisphere has been producing a lesser proportion of the world's crude year by year. This trend continued unchanged in 1949. In fact there was a reduction in volume as well as percentage of the world's total. Daily average output was 6,839,200 barrels in the western hemisphere compared with 7,271,300 barrels daily in 1948, a drop of 432,100 barrels daily average. Western hemisphere production was 73.3 percent of the world total in 1949 and 77.8 percent a year earlier.

In the eastern hemisphere the Near and Middle East and Oceania continued to expand crude production. Soviet Russia also contributed substantially to the growing production of the eastern hemisphere. The hemisphere as a whole produced 2,492,400 barrels per day compared with 2,077,900 barrels daily in 1949, an increase of 414,500 barrels daily average.

Production in the USSR appears to have exceeded the 1950 goal of the fourth five-year plan a year in advance. Average daily production for the year is estimated at 690,000 barrels compared with 611,000 barrels in 1948, an increase of 12.9 percent. Goal for 1950 was set at 675,000 barrels daily by Premier Stalin at the close of the war.

In 1948 the Soviet oil industry exceeded its quota for that year by eight percent with an increase in production of 13 percent over 1947. Drilling was increased 45 percent over 1947.

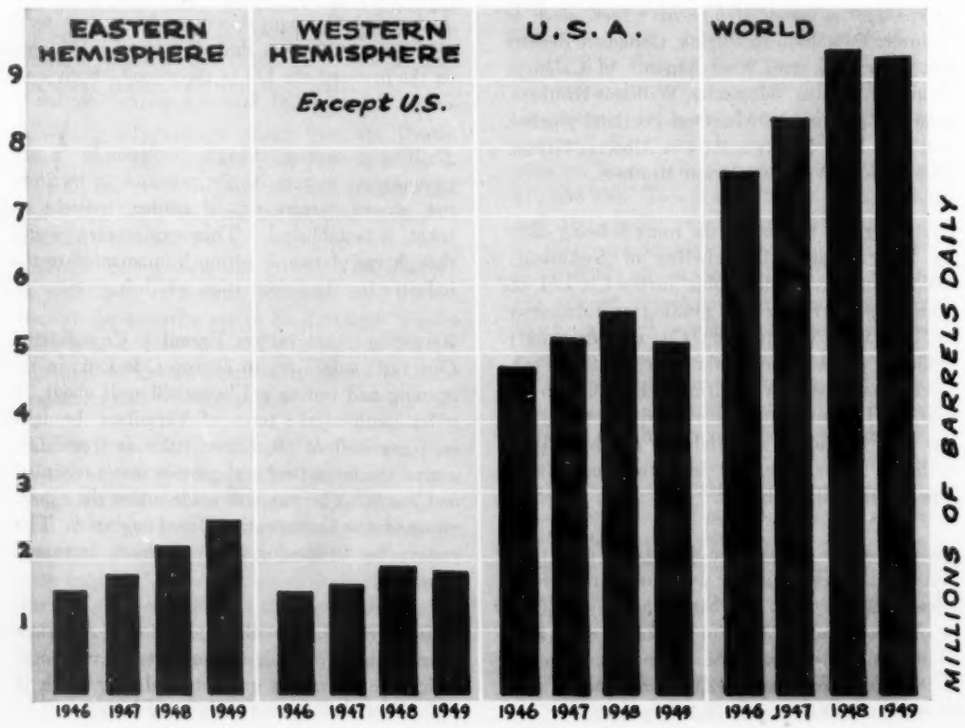
In the first half of 1949 there was considerable criticism of oil workers in certain areas. Some groups were ahead of their quota, while others lagged. In the last few months it is reported that drilling has been carried out more speedily with the result that production has been more satisfactory. USSR reports to the United Nations show that production was 99 percent of quota in the first quarter, 104 percent in the second quarter and 105 percent of quota in the third quarter.

Effort of the Oil Ministry was to complete the five-year plan in four years so that a new plan might be adopted to begin in 1950. To do this it was stated that it would be necessary to increase drilling by 58 percent over 1948 and crude production by 12.3 percent. Actual production in the first quarter was up only 10 percent and in the second quarter 12 percent. Third quarter production rose 16 percent over the same period in 1948, however, and averaged around 700,000 barrels daily. Recent reports indicate a current production level of about 711,000 barrels daily.

Government pressure has been responsible for stepping up Romanian production also, but 1949 output of about 85,000 barrels daily is still far short of prewar output. With older fields continuing a normal decline, it is doubtful whether Romanian production can be restored to its former volume without an active wildcatting program. Other USSR satellite countries where production has been increased are Albania and Austria, the total volume in each case being small by world standards.

In western Europe the active development work in Germany served to increase output by 30 per-

Chart showing how the post-war trend of growth in world production was halted in 1949 except in the Eastern Hemisphere.



cent to 16,000 barrels daily. New discoveries have been made in both the Emsland and Hanover areas.

In most areas in the Near and Middle East market demand or transportation capacity are limiting factors in crude output rather than ability to produce. A notable exception to this is Egypt where production still is somewhat below national demand and where transportation is not a major problem. Egypt increased its output 9,200 barrels daily average in 1949 to 45,000 barrels daily. Domestic demand for petroleum products in Egypt is about 40,000 barrels daily, and in addition there is a market for bunker fuel of about 30,000 barrels daily, so it still was necessary to import about 25,000 barrels per day.

The new Asl field on the Sinai peninsula was brought on production early in the year and had produced 607,000 barrels in the first half year from three wells. The Sudr field production in the first half year was 2,634,000 barrels from six wells, almost as much as total production for the year 1948. Production of Ras Gharib continued its normal decline.

Completion of the new pipeline from Iraq fields to Tripoli on the Mediterranean permitted an increase in production from Iraq, despite the continued prohibition by Iraqi authorities of exports of crude through the southern leg of the pipeline system to Haifa. Iraq production in the first half year averaged 61,700 barrels daily, and this now has been increased to well over 100,000 barrels daily.

Improved eastern hemisphere demand has permitted an increase of 6.3 percent in production from Iranian fields by Anglo-Iranian Oil Co. Average for 1949 was 556,000 barrels of crude daily compared with 523,000 barrels in 1948. Bahrein production was unchanged at 30,000 barrels daily.

Most rapidly growing producing area in the world is in Kuwait, which is, of course, one of the latest great fields in the Middle East to be developed. Kuwait production in 1949 rose 114,800 barrels daily average or 90 percent to 242,000 barrels per day. Saudi Arabia, which was developed more rapidly during the immediate postwar period, had a flatter upward curve in 1949. Production rose 87,300 barrels daily average to 477,000 barrels per day compared with a rise of 144,300 barrels daily average in the previous year. The following tabulation gives average production of these two countries by months in 1949:

Thousands of Barrels Daily Production

1949	Saudi Arabia	Kuwait
January	524	209
February	532	246
March	490	242
April	524	280
May	502	258
June	481	239
July	401	238
August	455	190
September	412	246
October	487	261
November	455	N.A.*
December	N.A.*	N.A.*

*Not available at press time

Although 1949 was a busy year in Saudi Arabia, the Arabian American Oil Co. is planning an even more active program for 1950. By the end of the year Aramco investment in Saudi Arabia is expected to exceed $400 million. Program for the year includes:

Continuation of present extensive geological and drilling programs in the land areas of the concession. Increased program of exploration in marine areas of Persian Gulf. Continued American and non-American housing and recreational construction. Completion of gas-oil separator plant and pump station to handle oil production from northern end of Abqaiq field. Completion of a stabilizer plant at Abqaiq. Completion of an asphalt plant at Ras Tanura. A hard-surface road program. Wider distribution of petroleum products in Saudi Arabia. Continued development of operating facilities. On-the-job training for Saudi Arab employees. Enlarged development of an Arab sanitation and health program. And cooperation in a continued Arab industrial development program.

With political and other difficulties which formerly impeded work on the Trans-Arabian Pipe Line now removed, that project of short-cutting the road to market will move on apace in 1950. Approximately 400 miles of the Tapline system, including 314 miles for Aramco's gathering system in Saudi Arabia, have been completed thus far.

Construction camps are being established in Lebanon and Syria, and pipe for the line is being delivered in Beirut for the sections of the line which will run through Syria and Lebanon. It is expected that all the pipe necessary for the line will be delivered during 1950 and that the line will be in operation in 1951.

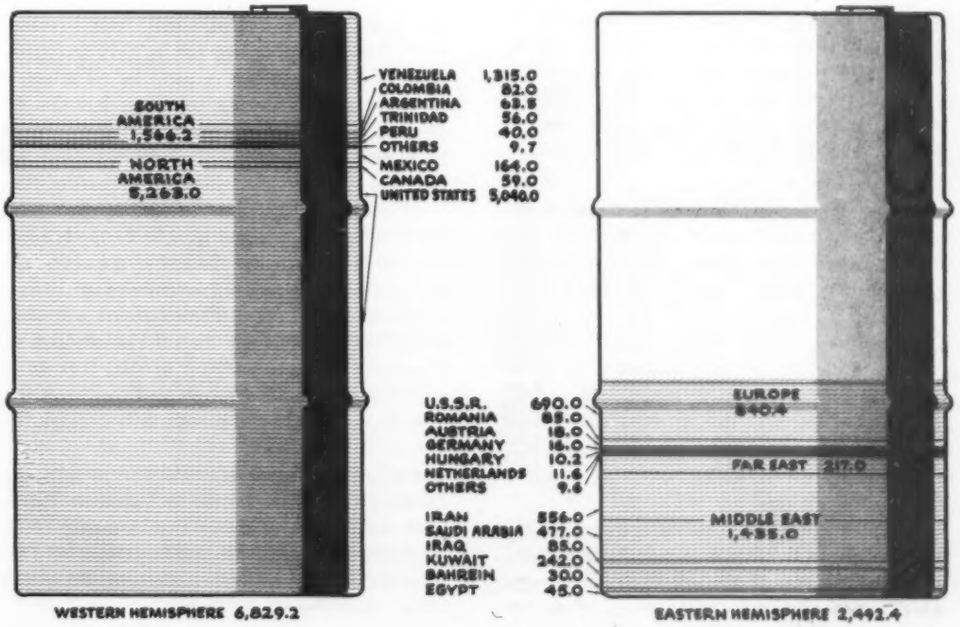
A newcomer in the area, American Independent Oil Co., has begun drilling its first wildcat in the Neutral Zone between Kuwait and Saudi Arabia. Results of this test are expected to be known within the next 30 days. Production is expected at a depth of about 5,000 feet.

In the Burgan field Kuwait Oil Co. Ltd. is drilling a deep test to determine whether oil is present at lower levels. Other drilling in Kuwait is of a development nature. Twelve rigs have been operating in the field.

In Oceania a newcomer as a crude supplier during the past year is New Guinea. Nederlandsche Nieuw Guinee Petroleum Maatschappij, the operator, shipped its first tanker load of crude from New Guinea in December 1948, and production has been on a steady basis during the past year at an average rate of about 4,700 barrels daily. Twelve wells on production in the shallow Klamono field produced 838,000 barrels in the first half year. NNGPM drilled six oil wells and two dry holes in the Klamono field in the half year. Depth of the producing horizon is 300 feet. The oil is 19 gravity. Wildcats were drilling on two other prospects. No production was taken from wells at Wasain and Mogoi which were drilled during 1940.

Political conditions in Indonesia still were too unstable to permit production in all areas, but development was rapid in some fields with the result that overall production rose 50 percent in 1950 to 131,300 barrels per day. This is nearly 40,000 barrels daily below the prewar level. No production was attempted in any of the north Sumatra fields or in Ceram, and only the Kroeka field in Java was being produced. This is one of the smaller fields on the island and yields only 1,380 barrels daily.

Analysis of production by countries in Eastern and Western Hemispheres in 1949.



In South Sumatra the Shell interests brought three fields in the Djambi area back on production after the long lapse in operations due to the war and subsequent political disturbances. Badjoebang had 12 flowing wells in operation by midyear with a production of 2,587 barrels daily. Kenali Asam with 37 wells rehabilitated was producing 9,422 barrels daily, and Tempino with 35 wells was producing 7,200 barrels daily by midyear. Betoeng and Meroeo fields still were inaccessible.

Of the ten fields in the Palembang area in South Sumatra developed by Shell, four are still inaccessible. Five are being operated, and these produced 25,200 barrels daily in the first half of the year. Most important of Shell's Palembang area fields is Talang Djimar with 51 wells which averaged 20,000 barrels daily in the first half of the year.

British Malayan Petroleum Co. Ltd. is carrying on an active drilling program in the Seria field of Brunei and stepping up production from 50,000 barrels daily in the last half of 1948 to 70,000 barrels daily in the first six months of 1949 from 148 wells. Six wells were completed in the first half of the year, and three were drilling on June 30. British Borneo output is now more than three times as great as prewar and has doubled in the past two years. It now has replaced Trinidad as the largest Empire source of petroleum.

Crude production in South America was curtailed sharply in the first half of 1949 because of the warm winter which limited fuel oil consumption in the United States. In the first six months production of South America averaged 1,574,000 barrels daily, a drop of 94,600 barrels daily under 1948. During the final half of the year improvement in demand for fuel oils brought the average for the year up to 1,566,200 barrels daily—almost up to the previous year's record.

Since most nations in South America do not have an exportable surplus of oil, their production did not fluctuate radically. It was only in Venezuela where market considerations caused producers to reduce their offtake severely. The following tabulation shows daily average production by months as far as official figures are available:

Venezuela Production, Thousands of Barrels Daily

	1949	1948
January	1,245	1,282
February	1,229	1,298
March	1,155	1,314
April	1,200	1,303
May	1,292	1,323
June	1,296	1,338
July	1,318	1,349
August	1,378	1,362
September	1,426	1,382
October	1,423	1,362
November	1,439	1,367
December	1,489*	1,339

*Estimated

Crude production in Colombia averaged 81,867 barrels daily in the first nine months and is estimated for the year as a whole at 82,000 barrels. This compares with a production of 65,100 barrels daily in 1948. The Dificil field increased its production in the first nine months of 4,360 barrels daily compared with 1,480 barrels daily in 1948. De Mares production was up 7,000 barrels to 32,000 barrels daily and Yondo up 2,000 barrels daily to 17,800 barrels daily.

Late in November Cartagena Petroleum Co. drilled in an 800-barrel producer on its Tetuan concession. The well is located on the upper Magdalena some 550 miles from the Caribbean, which tends to minimize the importance of the discovery. Additional wells will be necessary to suggest a considerable field before it would be economic to move the oil to market. The well was spudded on June 25, 1949 and completed on Nov. 25 at 4,579 feet. Two other wells drilled by other interests in the vicinity were unsuccessful.

Mexican production was up about 5,000 barrels daily in 1949 as a result of active drilling. The increase did not reflect the results of drilling late in the year by American interests. Under its contract with Petroleos Mexicanos, the Mexican-American Independent Oil Co. drilled in its first well late in November at 4,100 feet. The well tested at the rate of 1,170 barrels daily. On December 6 the company began another wildcat test on the north coast of the Isthmus of Tehauntepec, some 150 miles from the nearest production. Pemex hopes, with the aid of United States operators, to develop a substantial volume of oil for export.

In North America the most rapidly growing producing area is in western Canada. Canadian crude output averaged about 59,000 barrels daily in 1949 as compared with 33,800 barrels daily the previous year, an increase of 75 percent. Recent estimates are that the active drilling campaign in the Prairie provinces has developed a reserve of two billion barrels. When a pipeline to the head of the Great Lakes is completed, it is likely that Canadian production will expand largely beyond its present level, because Canada now is importing very large quantities of foreign oil.

Crude production in the United States decreased 468,900 barrels daily average in 1949 to 5,040,000 barrels daily. Total demand for oil products increased slightly during the year, but the decrease in production was made necessary in order to correct the stock position and to adjust for decreasing exports and increasing imports. In 1948 stocks of petroleum increased at the rate of 291,000 barrels daily and were becoming burdensome to the industry by the end of the year. Last year the industry reduced inventories at the rate of 30,000 barrels daily. These two items account for 320,000 barrels per day of the cut-back in domestic output. In addition to this, imports of oil increased 114,000 barrels daily average and exports declined 39,000 barrels daily average.

For the first quarter of 1950 the Supply and Demand Committee of the Independent Petroleum Association estimates that domestic crude demand will rise to 5,230,000 barrels daily. This is on the basis of an import schedule of 850,000 barrels daily from other countries.

World Crude Oil Production

Thousands of Barrels Daily

	1939	1947	1948	1949
North America				
United States	3,465.7	5,085.2	5,508.9	5,040.0
Canada	19.1	21.2	33.8	59.0
Mexico	162.0	159.0	159.0	164.0
Total No. America	3,646.8	5,265.4	5,701.7	5,263.0
South America				
Venezuela	567.0	1,208.0	1,339.0	1,325.0
Colombia	65.5	70.4	65.1	82.0
Argentina	51.0	60.5	63.8	63.5
Trinidad	52.8	56.1	54.9	56.0
Peru	37.1	34.8	37.5	40.0
Ecuador	6.3	6.5	7.4	7.2
Bolivia	0.6	1.0	1.3	1.9
Cuba	0.3	0.6	0.3	0.3
Brazil	—	0.2	0.3	0.3
So. America & Carib	780.6	1,438.1	1,569.6	1,576.2
Western Hemisphere	4,427.4	6,703.5	7,271.3	6,839.2
Europe				
Romania	128.5	78.5	79.5	85.0
Austria	11.7	16.9	15.0	18.0
Germany	12.3	11.6	12.3	16.0
Hungary	3.0	12.0	10.0	10.2
Poland	10.7	2.6	2.7	2.7
Netherlands	—	4.0	9.3	11.6
Albania	2.5	1.5	1.0	2.5
France	1.4	1.0	1.1	1.0
French Morocco	—	—	0.3	0.4
United Kingdom	0.1	1.0	0.9	0.9
Czechoslovakia	0.2	0.6	0.4	0.8
Yugoslavia	—	1.0	1.1	1.1
Italy	0.2	0.2	0.2	0.2
Europe Ex USSR	170.6	130.9	133.8	150.4
USSR	603.0	541.0	611.0	690.0
Europe	773.6	671.9	744.8	840.4
Near and Middle East				
Iran	214.0	424.0	523.0	556.0
Saudi Arabia	10.8	246.0	390.3	477.0
Iraq	84.5	98.0	72.5	85.0
Kuwait	—	44.6	127.2	242.0
Bahrein	20.8	26.0	30.0	30.0
Egypt	12.8	25.6	36.8	45.0
Near & Middle East	342.9	864.2	1,179.8	1,435.0
Far East and Oceania				
Indonesia	170.0	22.2	87.3	131.3
British Borneo	20.0	35.6	54.0	68.0
New Guinea	—	—	—	4.7
India	28.0	8.0	7.1	4.6
Pakistan				1.7
Burma				1.0
Japan	7.3	3.5	3.1	3.7
China	—	1.0	1.8	2.0
Far East	225.3	70.3	153.3	217.0
East. Hemisphere	1,341.8	1,606.4	2,077.9	2,492.4
World Total	5,769.2	8,309.9	9,353.2	9,331.6

Percent of World Crude Production

	1939	1947	1948	1949
Principal Nations:				
United States	60.0	62.0	59.0	55.5
Venezuela	9.8	14.2	14.4	14.2
U.S.S.R.	10.5	6.2	6.7	7.4
Iran	3.7	5.1	5.6	6.0
Saudi Arabia	0.2	3.0	4.2	5.1
Kuwait	—	0.5	1.4	2.6
Western Hemisphere:	76.7	81.0	77.8	73.3
North America	63.2	64.0	61.0	56.5
South America	13.5	17.0	16.8	16.8
Eastern Hemisphere:	23.3	19.0	22.2	26.7
Middle East	6.0	10.3	12.6	15.4
Oceania & Far East	4.1	1.0	1.8	2.3
Europe (incl. USSR)	13.2	7.7	7.8	9.0

De Haviland Comet, first long range, high speed jet airliner, undergoing flight trials in England.

REQUIREMENTS OF JET FUELS

By Eric Eltham

PROPONENTS of the gas turbine frequently point out that this engine can operate on anything from crankcase drainings to lighter fluid. Literally this is true. As a matter of fact, turbine engines have been built that are catholic enough in their taste to enjoy a diet of powdered coal. The prime consumer of turbine fuels is the jet engine in aircraft, and while theoretically the jet can consume anything that is fluid and combustible, actually there are restrictions on the properties of the fuel if it is to perform efficiently and reliably from sea level to 60,000 feet.

First and foremost, any type of engine used in aircraft must be reliable; secondly, it must be efficient. Both these criteria apply to the fuels used in the engine. There are today five grades of aviation fuel used in reciprocating engines: 80 octane, 91/98 grade, 100/130 grade, 108/135 grade and 115/145 grade. Fortunately, at the moment there are only two grades of jet fuel in use. Both these are regarded as interim fuels pending the adoption of a standard fuel based on the specifications set forth in the U.S. specification AN-F-58a (JP-3). The most widely used jet fuel is a kerosene type meeting U.S. specification AN-F-32a or British specification D. Eng. RD. 2482. The U.S. Navy for supply reasons has made it a practice to use grade 100/130 aviation gasoline as a jet fuel but can be expected to call for its engines to operate without reduction in performance in the JP-3 type fuel. Table I presents a comparison of the specifications of the three American jet fuels and the standard British jet fuel which, like JP-1, is a kerosene type fuel.

Table I

Specification	AN-F-32a JP-1	AN-F-58a JP-3	D.ENg. RD. 2482
Sp. Gr. at 60° F	0.850	0.728-0.802	
Flash point	100° F		100° F
Pour point	—76° F	—76° F	—40° F
Reid vapor pressure	2 psi	5-7 psi	
Aromatic content	20% max.	25% max.	20% max.
Heat of combustion Btu/lb.		18,400	18,300

In order to appreciate the significance of these specifications, it is necessary to understand the operating conditions that are peculiar to the jet engine. First and foremost it is necessary to contend with the large appetite of the engine which is at least three times greater than that of the reciprocating engine. The average jet will consume in the neighborhood of 480 gallons of fuel an hour, while the largest reciprocating engine in service will use, under cruising conditions, 160 gallons an hour. This means that for jet aircraft every operation from oil well until the fuel arrives in the aircraft's tanks must be speeded up or enlarged three times. For example, Captain Eddie Rickenbacker, president of Eastern Air Lines, has pointed out that fuel storage facilities must be increased threefold before jet transports can go into service. This is in itself no small item, and operators like Captain Rickenbacker with an eye on costs, are under no illusion that distillate fuels for jets will offer, gallon for gallon, an appreciable saving over high octane fuels now used in reciprocating engines.

This question of consumption immediately leads to the matter of availability. At this stage commercial operators, faced with the problem of integrating within the next few years jet transports into their operations, have not had time to consider this aspect of the introduction of the jet. But to the military services this is the crux of the whole matter, for fleets of jet fighters and bombers are useless if there is not the fuel available to fly them. And there is no doubt that the United States has committed itself to rely heavily on jets for its defense. Today there are thirty-four military jet airplane types flying or under evaluation in this country. In Britain, on the other hand, there are only about twenty-four.

In the field of commercial jet transports it is generally acknowledged that Britain is ahead of the United States. Already de Havilland has firm orders from British Overseas Airways and the British government for 16 of its jet-propelled Comets, the prototype of which made its first flight last July. There is also the Vickers Viscount, which employs turbo prop engines, now undergoing flight trials. Negotiations are under way with British and Australian airlines for approximately 50 of these aircraft which are ex-

pected to enter commercial service on BOAC's West Indian routes in 1952. This activity on the other side of the Atlantic has begun to worry manufacturers in the United States, and while at this writing no jet transport of American design has progressed beyond the drawing board stage, it is rumored that several west coast manufacturers are taking steps to transfer their blueprints to their experimental shops.

Meanwhile American airline operators have been taking a close look at the developments in Britain. There appears to be little chance that they will purchase British planes, however, because of the lack of availability, the problems inherent in the maintenance of foreign-built aircraft and, last but not least, the high fuel consumption of jets at this time. Ralph Damon, president of TWA, and Captain Rickenbacker have indicated that they look for the development of an American jet transport by about 1955 that will be superior in every way and particularly in fuel consumption. Meanwhile their present equipment, which is of the latest American design, will serve current needs. It should also be borne in mind that introduction of jet transports on the congested airways of this country will have to be delayed until adequate traffic control systems are installed.

Thus we see that in the United States the next five years will see constantly increasing demand for jet fuel for military purposes. Commercial requirements for this type of fuel will not come into being until about 1956.

During the late war aviation fuel production in the United States amounted to 400,000 barrels per day. It is difficult, if not impossible, to predict what the consumption would be in the event of another war. Every day improvements are being made in jet engines which are reducing the specific fuel consumption, but it is safe to say that it will be a long time before it is equal to that of the reciprocating engine. Referring to Figure 1, it will be seen that only six percent of a barrel of crude can be turned into kerosene type fuels. It is not difficult to predict that this will be wholly inadequate. The military services feel that sufficient volume can be obtained only by using 50 percent of available crude as jet fuel. On this basis, specification AN-F-58a has been written for JP-3 fuel calling for 80 percent of the gasoline, kerosene and diesel oil fractions to go to jet fuel.

Referring again to Table I it will be seen that the most outstanding difference between the wide range JP-3 fuel and the kerosene type fuel it replaces is the high vapor pressure of the former fuel. In fact the vapor pressure of JP-3 is the same as that of aviation gasoline. In some respects this is advantageous because it assists starting, particularly under cold conditions. This property is responsible for a wide difference in the explosive limits of JP-1 and JP-3. As can be seen in Figure 2, the JP-3 is the more hazardous in the tanks of an aircraft at low temperatures, while the JP-1 is the more hazardous under the higher temperatures that might be expected in an aircraft's tanks during the summer months. During fueling operations it should be noted that particular care must be taken with the wide range fuel at temperatures from —40°F to 32°F, while with the kerosene type fuel the danger during refueling is slight at temperatures below 100°F. Refueling personnel have been accustomed to handling gasoline which is very similar as far as explosion risk is concerned to the wide range JP-3, and the adoption of this fuel will present no unfamiliar hazards.

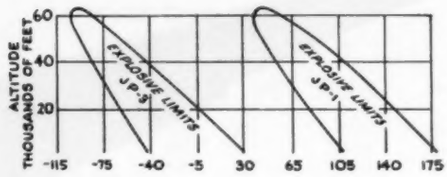


Fig. 2—Comparison of explosive limits of Fuels JP-1 and 3.

One aspect of the wide range JP-3 type fuel that is being examined very closely is the loss of fuel arising from evaporation or even boiling at high altitudes. For example, a fuel with a Reid vapor pressure of seven psi will boil at 35,000 feet if at a temperature of 70°F. The outside air temperature at this altitude is around —60°F, and the fuel would not boil at this temperature except at an altitude of over 150,000 feet. But a jet aircraft will have got to 35,000 feet in from four to seven minutes, hardly long enough for the fuel in its tanks to have dropped appreciably below ground temperature. As a result, evaporation and boiling can account for a 10 percent loss in fuel in climbing to 35 or 40,000 feet. At the same time boiling can occur in the fuel lines, and this can make the fuel pump inoperative. Thus, it can be seen that while it is desirable from a supply point of view to use a wide range fuel with a high vapor pressure, the problem of evaporation, boiling and vapor lock may require a reduction in the specified Reid vapor pressure of 5-7 psi.

The low temperature properties of jet fuel are also important. The fuel must flow freely from the tanks to the injector nozzles at temperatures as low as —76°F. At its freezing point, which is not necessarily as low as the pour point, a fuel begins to form wax crystals which may collect in the filters, leading to filter clogging. The fuel pumps will not be seriously affected by these crystals, and the shearing action of the pumps in all probability will reduce the pour point. Consideration of pour point and freezing point would indicate that the freezing point is the more critical so far as reliable operation and that care should be taken in formulating fuel blends to exclude components that contain waxes melting above —76°F. Operation of the fuel filter is also susceptible to the formation of ice crystals. Dissolved water is always present in fuel because of condensation. While the quantity of water involved is very small, amounting to only 0.1 gallon per 1,000 gallons of fuel at 85°F, it is rapidly thrown out of solution as the temperature is lowered and can very easily form ice in sufficient quantities to interrupt the operation of the filters. This, of course, is beyond the control of the refiner. The solution appears to be in the injection of alcohol into the fuel before it enters the filters, though it may be possible to dope the fuel with additives that would reduce the freezing point of water. Another approach would be to dry the fuel chemically as it enters the aircraft's tanks and to dehydrate the air entering through the vents in the fuel tanks.

Propellers of the Armstrong-Siddeley Python turbo-propeller engine in Westlan Aircraft's Wyvern T.F.2. Shell photograph.

Good combustion depends upon complete atomization of the fuel in the combustion chamber, just as the performance of a gun-type oil burner depends upon the same factor. Atomization, of course, is a function of injection design, but this is not a simple problem because the fuel changes in viscosity with temperature, and, it will be recalled, the temperature may vary all the way from above 100°F to —70°F. Pilots starting jets under cold conditions often experience "hot starts," or explosions in the combustion chamber which are a result of the ignition of raw fuel. These hot starts raise the temperature of the gases passing through the turbine wheel to above 1,400°F, and this can lead to turbine blade failure.

Starting under conditions of extreme cold is a common occurrence. This is because jet engines develop maximum efficiency at full speed, and it is customary to operate them as wide open as possible. A pilot will control the speed of a multi-engine plane by cutting out two engines when he has reached cruising altitude and only start them again when more power or speed is needed. Since the cruising altitude may be 30,000 feet or more, the temperature will be very low. Liquid fuel can build up in the combustion chambers under these conditions and result in a hot start and engine failure.

The most recent development in fuel atomization is the variable area fuel nozzle designed by the National Advisory Committee for Aeronautics in Cleveland. This nozzle has the property of providing constant fuel pressure regardless of the altitude, and its delivery is unaffected by fuel viscosity. Furthermore, it permits the temperature of the exhaust gases to climb to 1,400°F and holds this temperature constant.

Combustion should also be as clean as possible because carbon deposits on the walls of the liners in the combustion chambers lead to overheating. This results in failure of the liners. Aromatics are naturally the prime offenders when it comes to carbon formation. But, on the other hand, supplies of jet fuel can be extended considerably if aromatics are included. As a result, the specifications for jet fuel have been written in the spirit of compromise. The currently used JP-1 fuel has a maximum of 20 percent aromatics, while the wide range JP-3 fuel may contain up to 25 percent aromatics.

Jet engines are still in their infancy, and while their refinement is proceeding at an accelerated rate, it will be some time before sufficient experience is acquired to design and build a truly efficient engine. Fuel consumption is the most important question to be solved, and the ultimate solution will depend to a large extent on the ability of the metallurgists to come forward with turbine blades which can withstand temperatures of 2,000°F or more. The type of fuels to be used, both now and in the future, will depend to a large extent upon availability. For the present, the military are the only customers for jet fuel, and the military will call for a fuel having maximum availability. This is the reason for the wide range fuel called for in specification AN-F-58a. This specification may be modified, particularly with respect to vapor pressure. Refiners considering jet fuel facilities, however, can design them for the currently specified JP-3 fuel, for its successor will not call for any significant changes in processing.

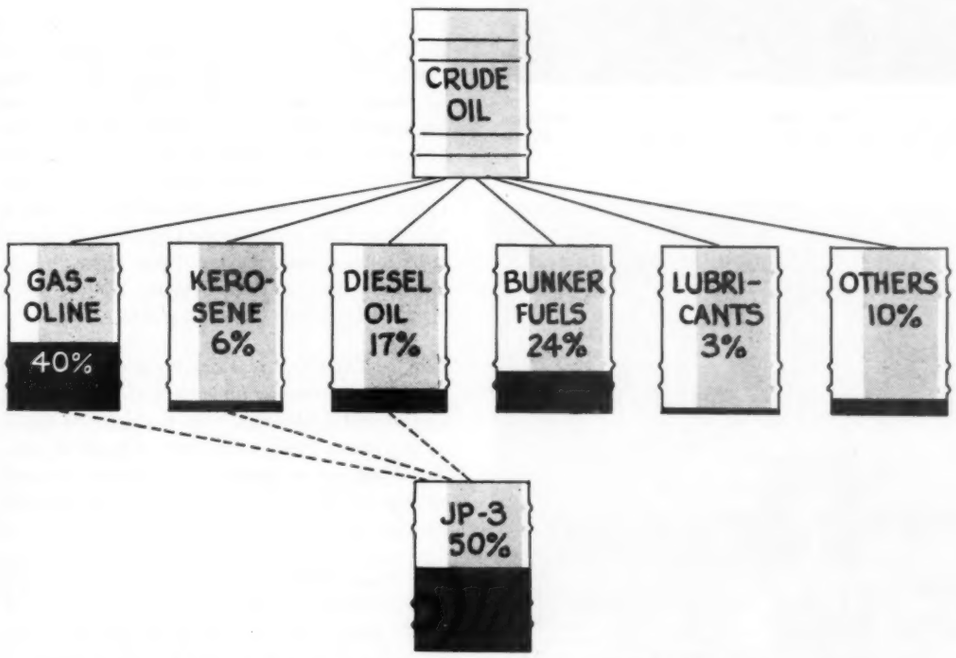
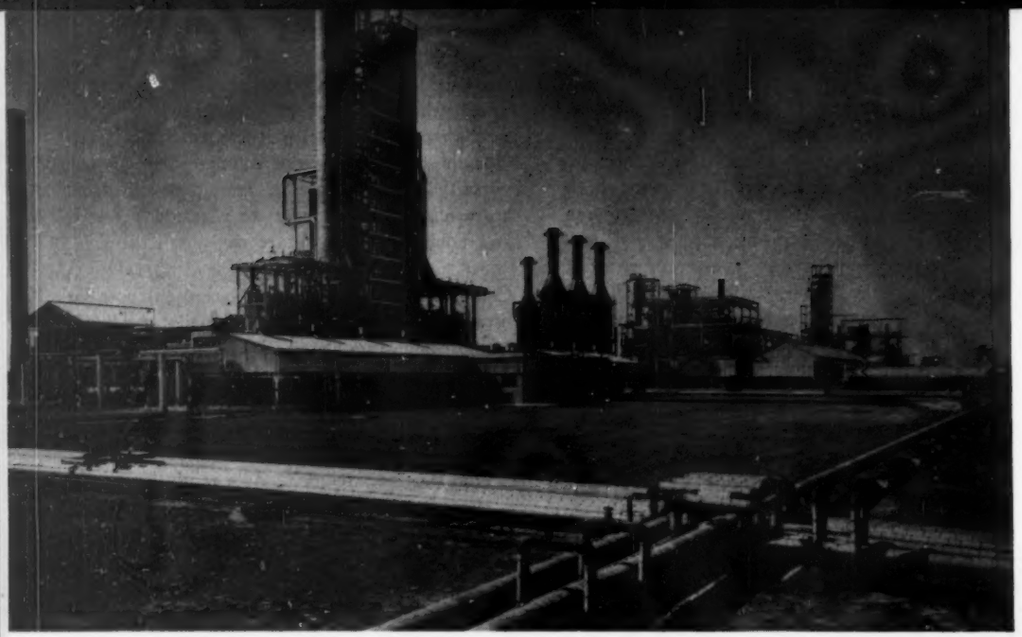


Fig. 1—Only six percent of a barrel of crude can be converted into kerosene-type fuels.

The De Haviland Comet is a 36-seat airliner with four D. H. Ghost turbojet engines. Shell photograph.

6,000-BARREL LUBE PLANT DEDICATED BY CIT-CON

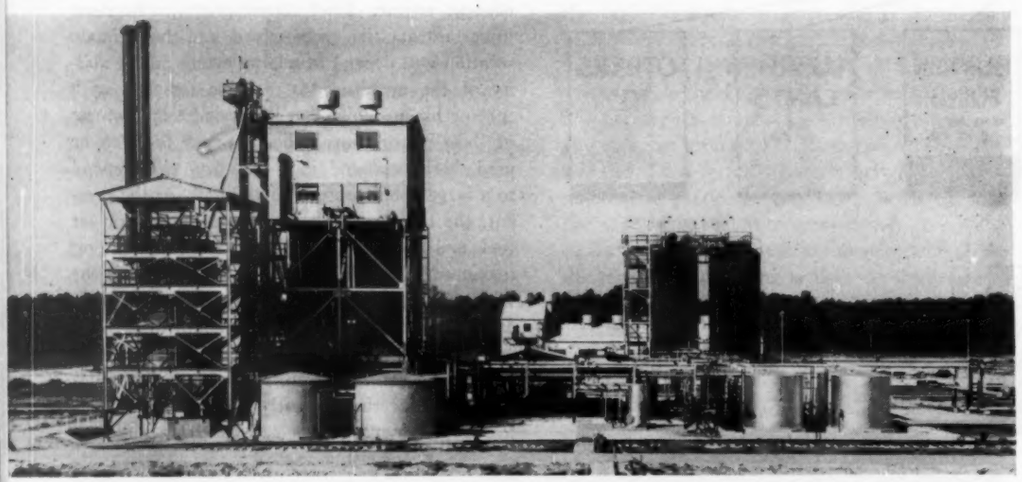


View of one leg of an "L" shaped layout of Cit-Con's processing units. From left to right, two vacuum distillation units, Duo-Sol plant and furfural solvent refining unit. All photographs used with this article were supplied through the courtesy of The Luminus Co

ON DECEMBER 8 Cit-Con Oil Corp. dedicated its new $42 million lubricating oil plant at Lake Charles, La. The lube plant has been built on a 367-acre tract adjacent to the refineries of Cities Service Oil Co. and Continental Oil Co., owners of the new installation. The Cities Service Lake Charles refinery is only a mile from Cit-Con while the Continental refinery is six miles distant, making it convenient to supply crude fractions from topping stills by short pipelines from either or both plants.

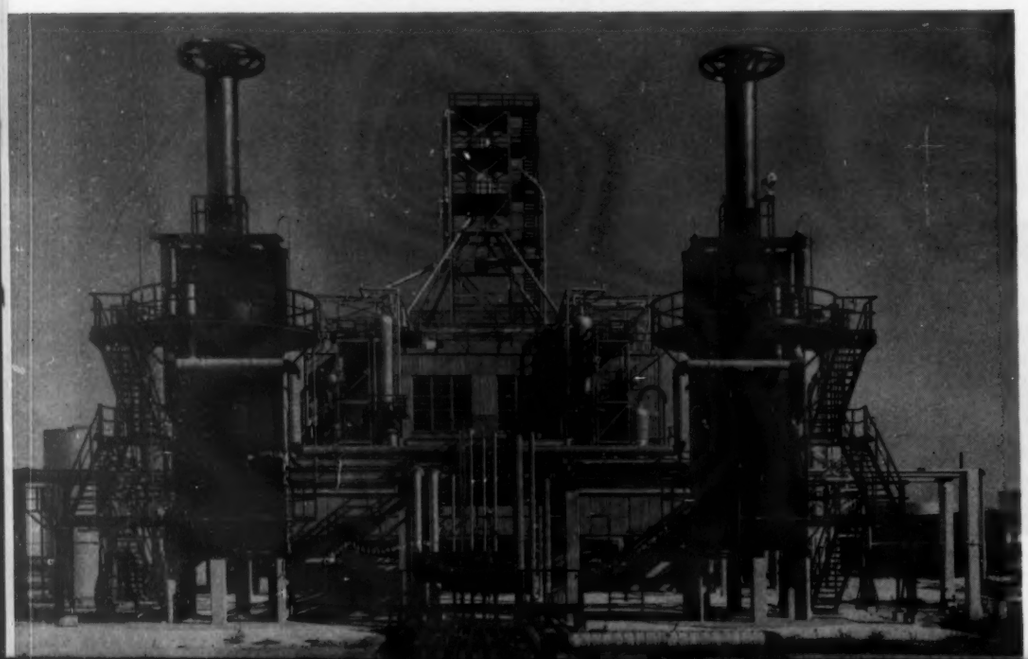
Cit-Con Oil Corp. was organized in 1947 with Cities Service owning 65 percent of the stock and Continental 35 percent. Construction was begun in November 1947, and some units were completed and put on stream during the summer and autumn of 1949. Final completion was this past month.

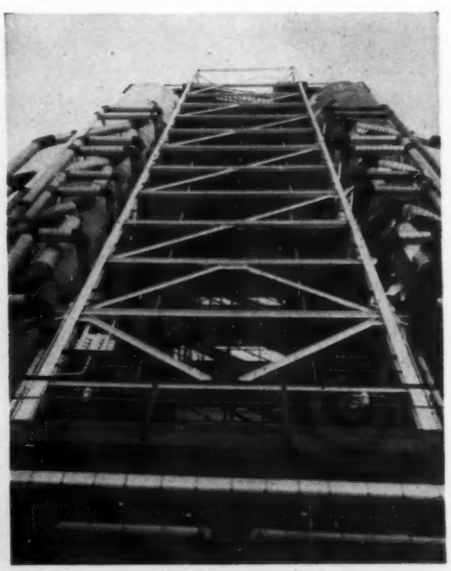
Feed stock requirement for the plant at design capacity totals 18,000 barrels daily. Of this 12,000 barrels will be returned and 6,000 barrels finished as lubes and waxes. The plant will produce five lubricating oil base stocks of 95 or



Wax finishing unit showing percolation filters at left and acid treating at right. This plant is capable of handling approximately 1,000 B/D of wax charge.

Clay contact filtration units. These units are capable of processing a total of 6,000 B/D of finished blending base stocks which have been previously solvent refined and dewaxed.





Unusual view of Cit-Con's vacuum units for preparation of raw lube stocks serving as charge to the solvent refining units.

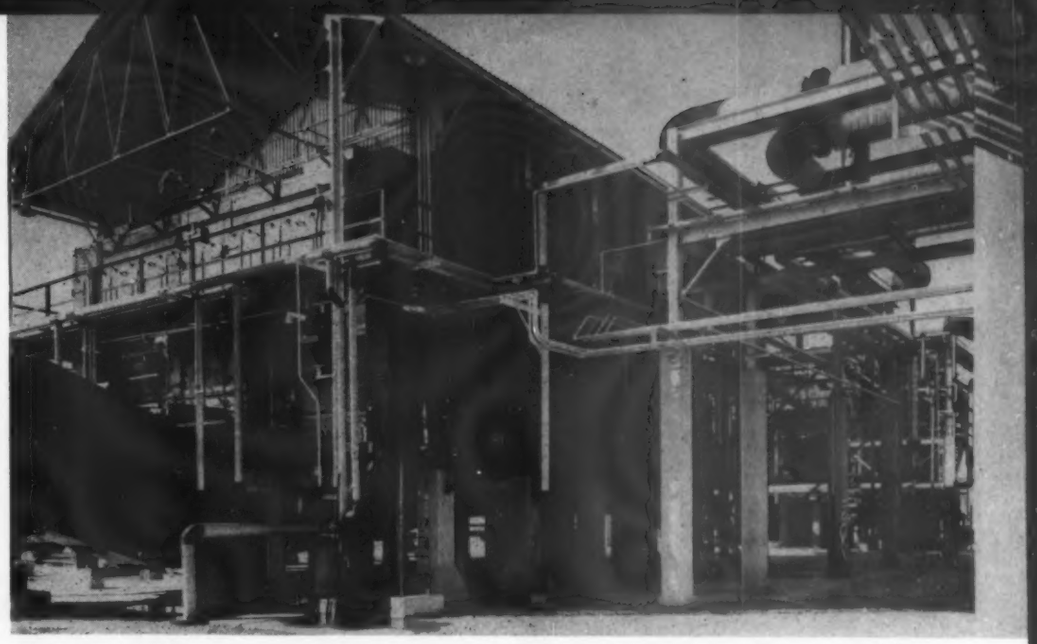
higher viscosity index for blending into finished automotive and industrial oils. It will produce also fully refined and amorphous waxes.

The Lummus Co. designed and built the entire plant with the exception of the Duo-Sol unit which was designed and built by Max B. Miller Co. Lummus-built units consist of two vacuum distillation plants, a furfural unit, two MEK dewaxing plants, two clay contact plants, wax finishing and wax slabbing plants, laboratory, offices, change house, steam plant and shops.

Outstanding among the many engineering innovations introduced by Lummus at Cit-Con is the construction of the two vacuum distillation units, designed as twin units with some over-capacity to permit producing a higher proportion of neutral oils to bright stock when required. This provides flexibility and continuity of operation, and each unit can handle 12,500 barrels a day of reduced crude. The units will produce close-cut lube distillate fractions which will not require re-running for viscosity control.

The fractionator column of each unit measures 114 by 13 feet, and is equipped for the most part with Lummus-designed "shower" trays, except for conventional bubble decks for the top tray, the two trays above the charge inlet and several in the residuum stripping section. Such design permits a small diameter tower and reduces overall pressure drop. The "shower" tray installation divides the descending reflux into thousands of small streams through which the upcoming vapors must pass. Besides a lower pressure drop and reduction in tray area for a given charge rate, another advantage compared to bubble decks consists of a substantially increased vapor velocity without danger of flooding.

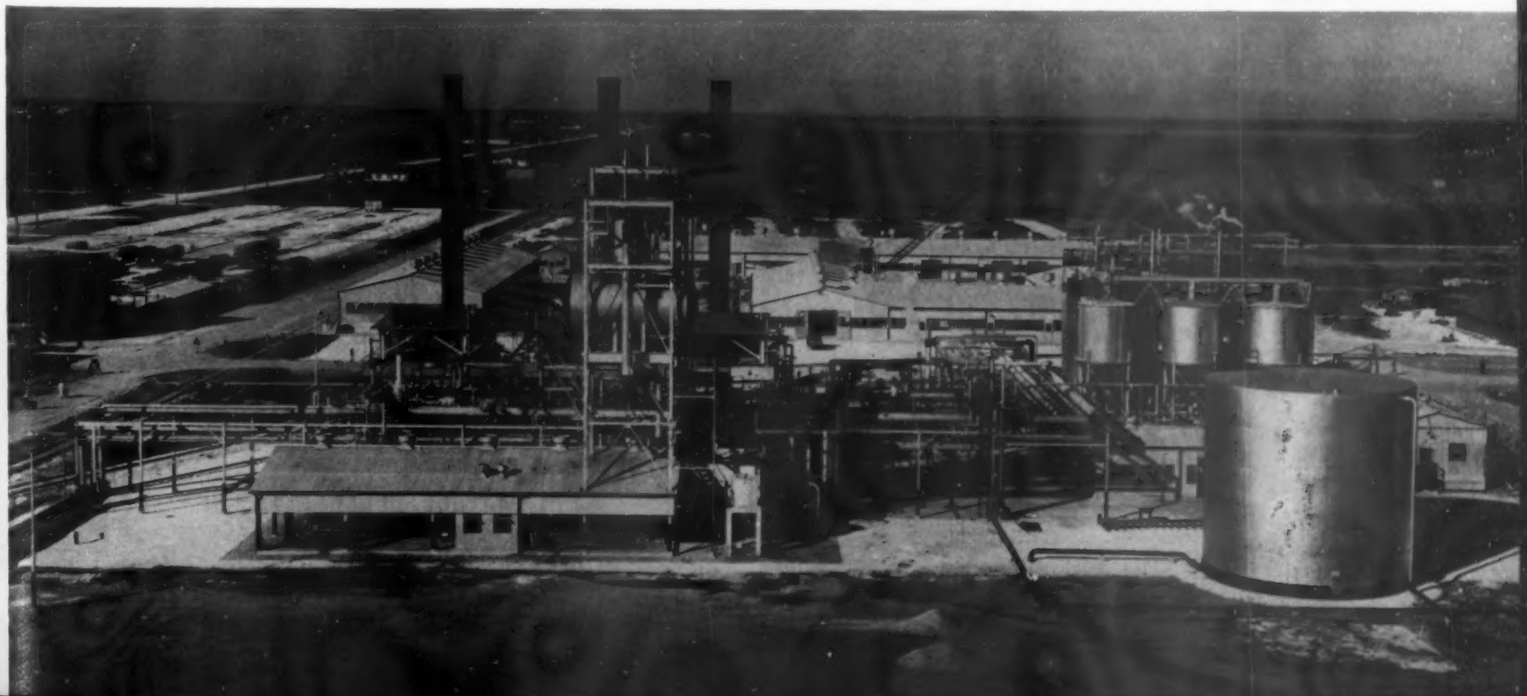
The furfural extraction unit—the largest ever built—is conventional in basic design, but features a number of technical refinements. The solvent circulation rate has been set at 30,000 barrels a day, and recovery equipment designed accordingly in order to permit the same charge



Lummus oil heaters in service for vacuum distillation units.

View showing vacuum distillation unit pump house interior.

Cit-Con's utilities including boiler house capable of produ cing 375,000 pounds of steam continuously at 600 psi and 650°F, water treating, air compressors in the foreground; warehouse and shops, water cooling tower, right background.



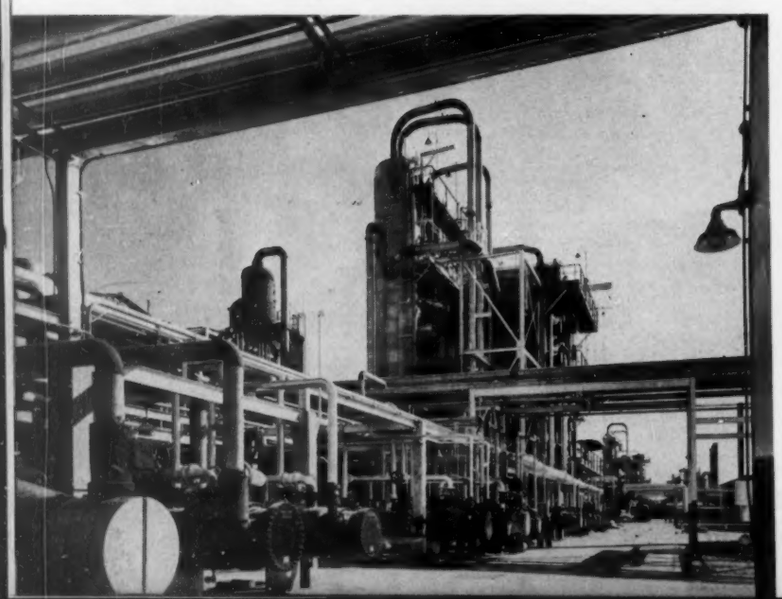
Cit-Con's furfural refining unit, one of the largest units of its kind with a total solvent circulation of 30,000 barrels daily. This unit solvent refines the four distillate cuts from the vacuum unit to 95 to 100 viscosity index.

Cit-Con's water pump house handling approximately 50,000 GPM water to cooling tower. Motor-driven pumps are in the foreground. Pumps in the rear are turbine-driven through right angle spiral bevel gears.

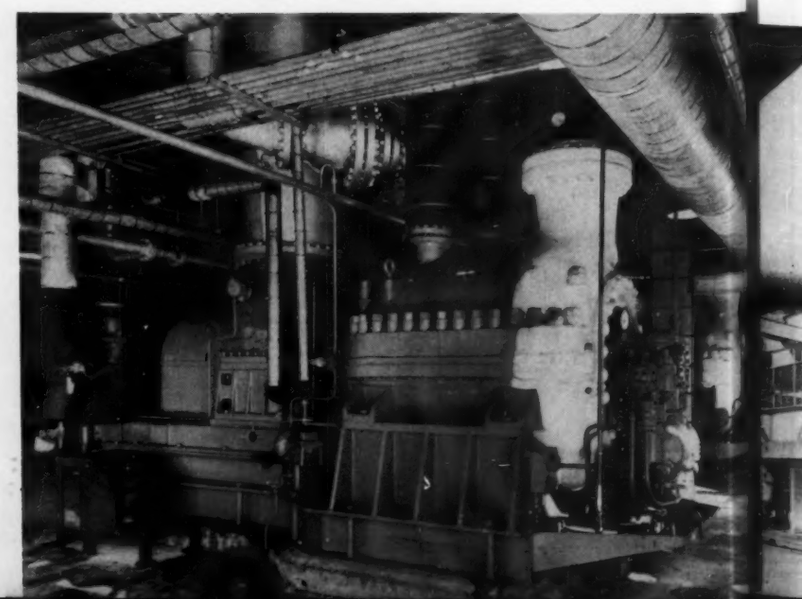
rate from both 95 and 100 V.I. operation. Four stages of solvent recovery are used on the extract phase in comparison to three as in some furfural units. Such a large volume of solvent is handled that a heater, absorbing 75 million Btu's an hour, is required to evaporate solvent in the charge to the pressure flash chamber.

At Cit-Con the MEK solvent dewaxing process comes after the solvent refining of all raffinate stocks. It was found that to dewax after a solvent refining is less expensive and that the produced wax contains a higher quality oil if first solvent refined, thus simplifying the job of treating the wax to the fully refined state. No. 1 MEK dewaxing, which handles the three lightest distillate stocks, features a recrystallization system and is designed to permit modification for incremental dilution in the future. Four vacuum filters remove the wax. No. 2 MEK, which handles the heavy intermediate distillate and

Heat exchange and recovery towers of No. 1 MEK dewaxing unit. Two MEK units are provided, one for heavy stocks and the other for light distillate stocks.



Propane refrigeration compressors for No. 2 MEK dewaxing unit at Cit-Con.



bright stock, has six primary filters.

Propane and a blend of phenol and cresylic acid are used in the Duo-Sol unit to remove undesirable compounds from the bottom residuum stock. All or a part of the heavy distillate fraction may also be refined in this unit. The Duo-Sol plant will have an oil-charging capacity of 9,700 barrels per day. It is the largest of its type in the world. The solvent treating extractor section will have seven extractors 90 feet long with the largest ten feet in diameter.

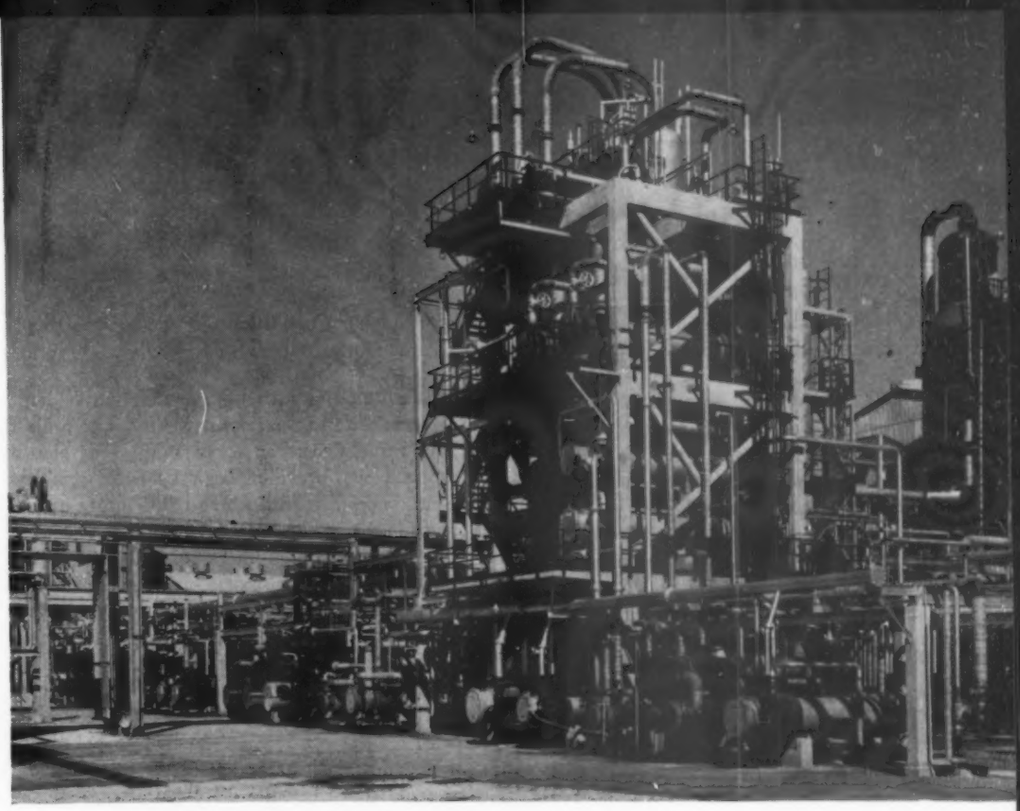
For clay contacting of dewaxed oils to improve color and stability, two identical plants incorporating latest design have been built. One will handle the three lightest stocks; the other, the two heaviest stocks. Each is capable of treating from 2,800 to 3,600 barrels of oil daily to improve color and stability.

The wax finishing plant consists of acid treatment and percolation filtration through bauxite for removal of odor and taste and improvement of stability. The wax plant is capable of producing 1,500 barrels daily of fully refined and microcrystalline waxes, about 15 percent of the nation's total production.

The laboratory is furnished with equipment for both routine and control tests, as well as for experimental investigation in furfural extraction, clay contacting and wax percolation, batch experimental vacuum stills and deasphalting. An MEK dewaxing unit is also provided to permit special studies of dewaxing problems.

Storage capacity totals over 1,700,000 barrels in 134 tanks ranging in size from 300-barrel to 80,000-barrel capacity. Due to climatic conditions and the large volume of oil handled, special provisions have been made for storage and loading operations.

To prevent moisture condensation on the inside of finished oil storage tanks and resulting water contamination of oils, special equipment dries air flowing into these tanks while oil is being withdrawn. Mechanical agitators insure uniformity of storage tank contents.



Another view of one of MEK dewaxing units showing heat exchanger bank.

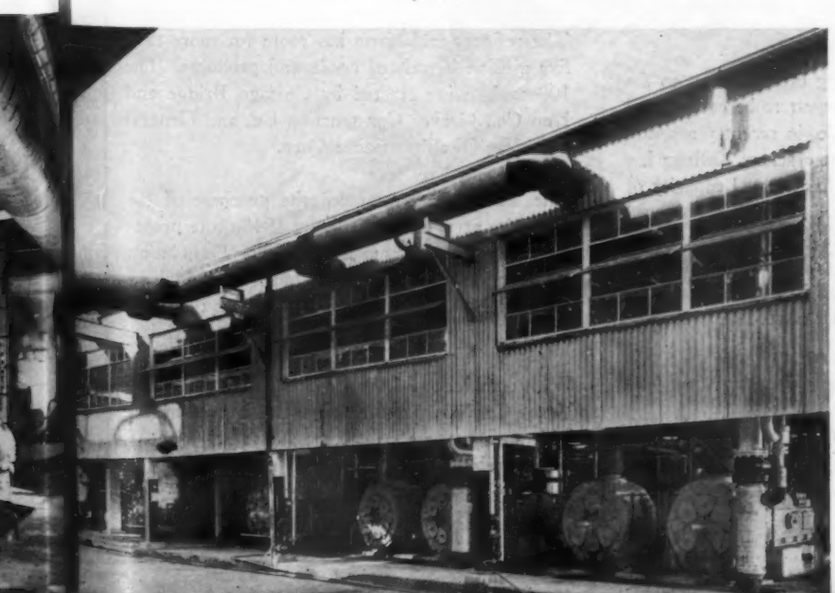
Electric power for Cit-Con is supplied from the Cities Service Refining Corp. Three steam boilers, each with capacity to produce 125,000 pounds per hour of steam at 650 psi pressure, supply Cit-Con's steam requirements. Water is produced from three wells, 500 to 700 feet deep, on the property. An accompanying photograph shows the group of centrifugal pumps used to pump 51,000 gpm of cooling water.

The Cit-Con plant is so located that ocean tankers may be loaded for export and intercoastal deliveries. Barges may be loaded for shipment to points on the intra-coastal barge canal and up inland waterways such as the Mississippi and Ohio rivers.

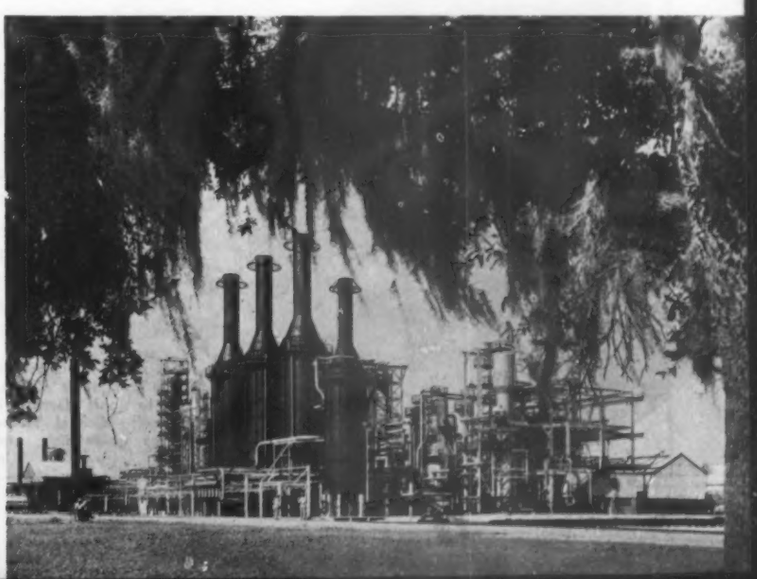
Members of Cit-Con's board of directors are: W. Alton Jones, president, Cities Service Co.; L. F. McCollum, president, Continental Oil Co.; Burl S. Watson, president, Cities Service Refining Corp.; Harold G. Osborn, vice president, Continental Oil Co.; Henry L. O'Brien, first vice president, Cities Service Co.; Serge B. Jurenev, vice president, Continental Oil Co.; A. P. Frame, president, Cities Service Research & Development Co.; J. W. Liddell, regional general manager, Continental Oil Co.; George L. Mateer, vice president, Cities Service Research & Development Co.; and L. D. Mann, vice president, Cities Service Refining Corp.

Cit-Con officers are: W. Alton Jones, chairman; Burl S. Watson, president; A. P. Frame, vice president; Harold G. Osborn, vice president; F. M. Simpson, vice president and general manager; B. R. Johnstone, secretary; C. E. Weger, treasurer; E. E. McWhiney, assistant secretary and assistant treasurer; B. M. Scofield, assistant secretary; and L. M. Coleman, assistant treasurer.

Vacuum pumps at right and propane compressors at left for one of MEK dewaxing plants.



Duo-Sol unit for refining of residual stock.



TEXAS COMPANY COMPLETES EAST COAST REFINERY

The Texas Co. dedicated its first large Atlantic coast refinery early in December with ceremonies attended by New Jersey state and local officials. The 40,000-barrel addition to the group of refineries in the Philadelphia-New York coastal area together with other construction work nearing completion will bring crude capacity of the district to more than 1,000,000 barrels daily.

The east coast was the largest refining area in the United States at the close of World War I, but its relative importance declined during the next 20 years, while Texas and Louisiana oil fields were being developed so rapidly. It proved to be more economic to refine mid-continent oil on the Gulf coast and carry refined products to eastern markets by tanker than to ship crude to the Atlantic seaboard for refining.

Greater dependence on foreign crude anticipated in the future is recreating the east coast as a growing refining district. It is, of course, cheaper to refine Middle East or Latin American crude in New Jersey for eastern markets than to refine on the Gulf coast and reship products to final eastern destinations.

The Texas Company's Eagle Point refinery at Westville, N. J., is a project conceived by the company's planning committee near the close of World War II. Construction was undertaken in 1947 when there was much apprehension in the industry about future domestic crude supplies. Plans for the refinery were drawn to permit a wide latitude of choice in raw materials to be processed. Equipment was built to resist corrosion when operating on high sulfur crudes of the Middle East or west Texas. A plant feature which is new to this particular area is the recovery plant built to manufacture sulfur from hydrogen sulfide evolved from sour crudes. Freeport Sulphur Co. will operate the unit which has a capacity of about 400 tons per day.

It is unusual for such a large refinery to be built at one time on a spacious new site. The project gave the designers an opportunity to develop a unitized plan providing logical flow of products from crude to refined storage. Of future importance is the layout permitting additional units to be erected in parallel lines. Space is provided for the building of four similar plants without interference with the present operation in any way. Wide throughways have been provided for piping to facilitate future expansion and to simplify maintenance. An accompanying drawing (Fig. 1) illustrates how the various plant units are located for efficient flow and how additional plants may be installed at the left of the present plant as required. Even the office building is so designed that it may be expanded by units.

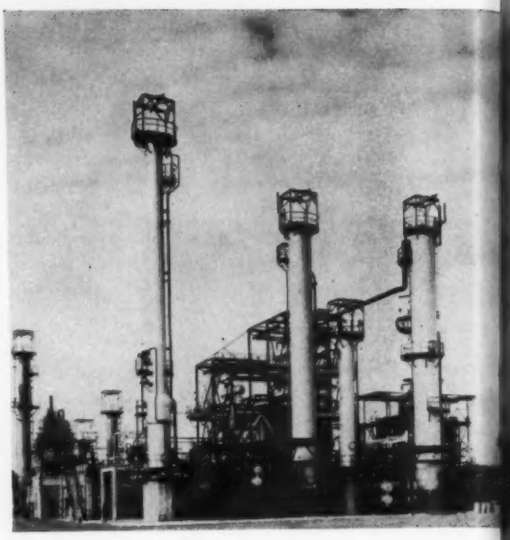
The 1,600-acre site for the Eagle Point works fronts for 2¼ miles on the Delaware River eight miles from Camden and directly across from the Philadelphia Navy Yard. At the outset docking facilities were provided for the simultaneous handling of three ocean tankers and three barges.

Primary crude distillation is accomplished in an atmospheric and vacuum crude pipe still designed and built by Foster Wheeler Corp. This same company designed and built the steam and electric generating plant, consisting of three 275,000-pounds-per-hour steam boilers generating steam at 900 pounds, and two 7,500 KW turbo-generators, plus necessary water-treating facilities.

The crude distillation unit is a mirror image of a unit built for the same company at Port Arthur, Texas, except that lubricating oil stocks will not be manufactured at Eagle Point. The distillation unit is one of five which Foster Wheeler has built for The Texas Co. in the postwar refinery program of the company. Main flow of the Eagle Point unit is the same as in the flow diagram of the Port Arthur still reproduced as Fig. 2.

The fluid catalytic cracking unit adjacent to the crude still is one of the largest to be constructed by The M. W. Kellogg Co. in recent years, and the biggest of the eight cat crackers Kellogg has engineered for Texas. It has a rated capacity of 25,000 barrels per stream day. It is a balanced pressure design unit with the reactor and regenerator supported at the same level. The precipitator is cylindrical and has special features built in to minimize exhaust noise.

Gov. Alfred E. Driscoll of New Jersey, throws switch to begin operations at the new $60 million Texaco plant. Left to right: Harry T. Klein, Texas Co. president; Gov. Driscoll; Michael Halpern, Texaco vice president in charge of refining; and A. M. Martin, plant superintendent.



The unit incorporates, among other recent developments, the internal slurry settler in the fractionator, which not only cuts down the initial cost of the unit by eliminating much piping, structural steel and valving, but also increases the safety of the operation.

The catalyst-carrier lines of this cat are particularly interesting because they are the largest one-piece bends ever made on Kellogg's pipe-bending machine. With a diameter of 60 inches, these pipes have been bent in one piece, rather than constructed of several segments. The smooth interior contour achieved minimizes the effects of erosion caused by the rapidly moving catalyst.

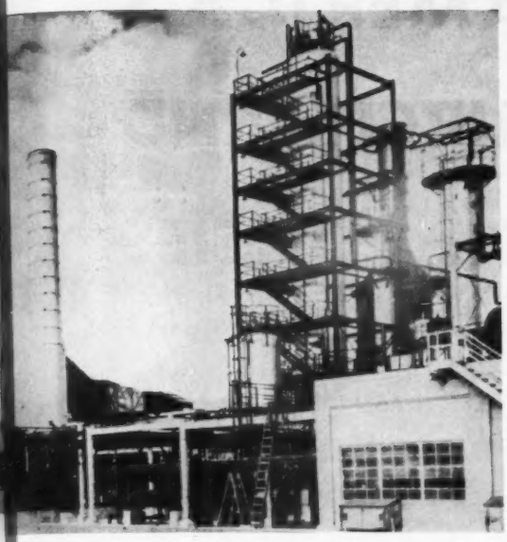
In addition to the normal treating facilities for light products, the Eagle Point works incorporates a furfural treating unit of new design for the removal of sulfur from middle distillates for diesel fuel and furnace oils. The furfural plant follows designs developed in pilot plant operations at The Texas Co. research laboratories and is the first commercial unit to be built. A Linde unit will treat furnace oils as well as gasoline.

For octane improvement of straight-run naphtha, a 10,000-barrel thermal reforming unit has been built. Remaining auxiliary processing unit is the catalytic polymerization plant.

The refinery tank farm has room for more than five million barrels of crude and products. The 100 tanks were erected by Chicago Bridge and Iron Co., Graver Construction Co. and General American Transportation Corp.

The Texas Co. announced the purchase of the plant site at Westville in May 1946. Site preparation work was begun a year later. Foundation construction was begun in January 1948. As many as 3,500 persons were at work on the plant site during peak periods of construction activity.

With completion of the Eagle Point works, The Texas Co. has 15 refineries in the United States with an aggregate crude capacity of about 490,000 barrels daily.



Shown at left are the catalytic polymerization and thermal reforming units. Above is the newly-developed furfural unit for processing middle distillates.

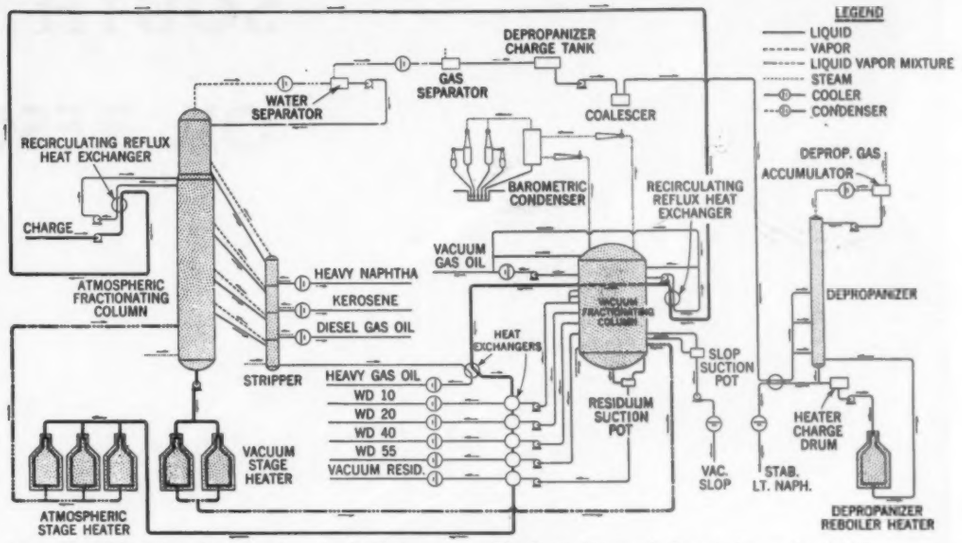
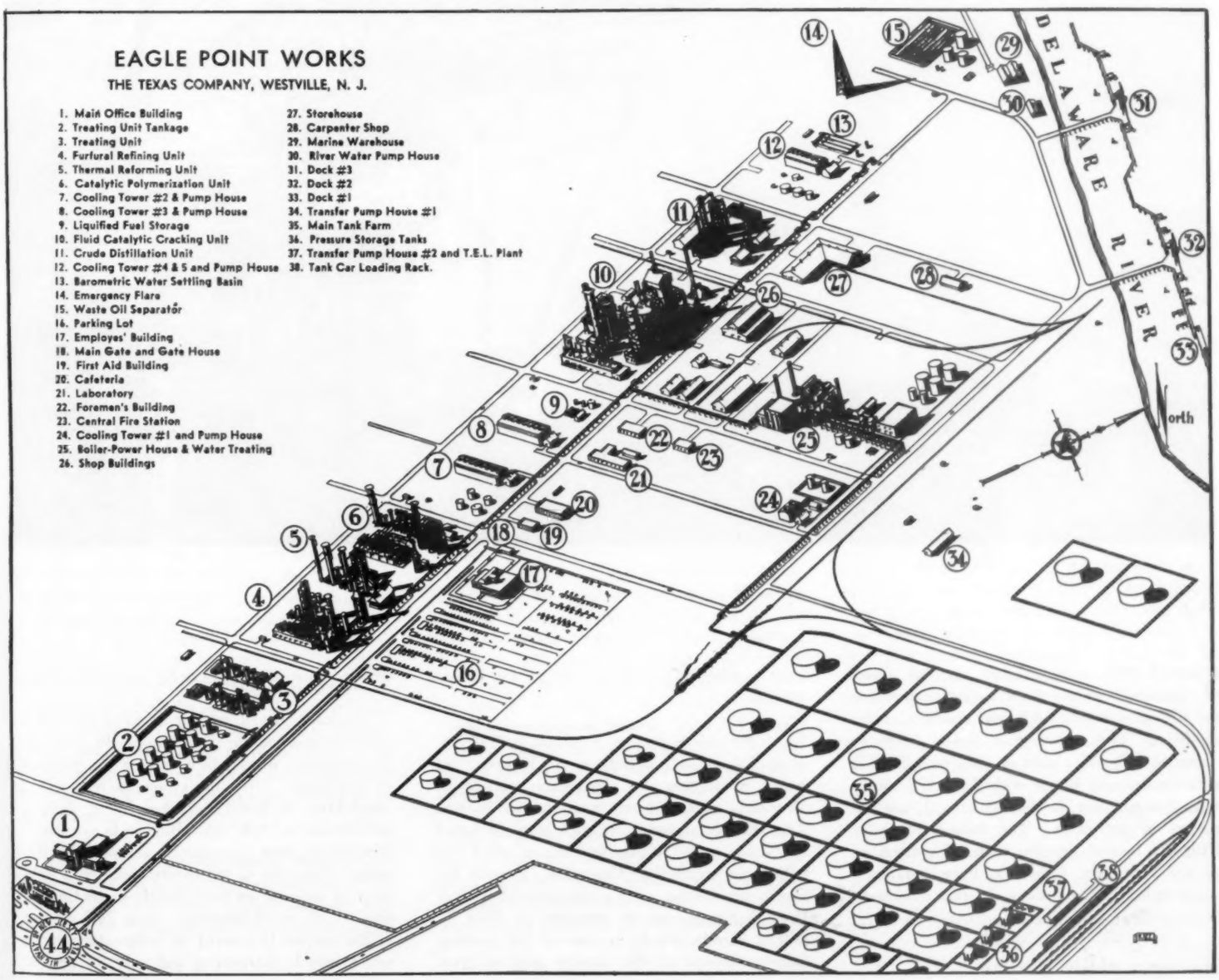
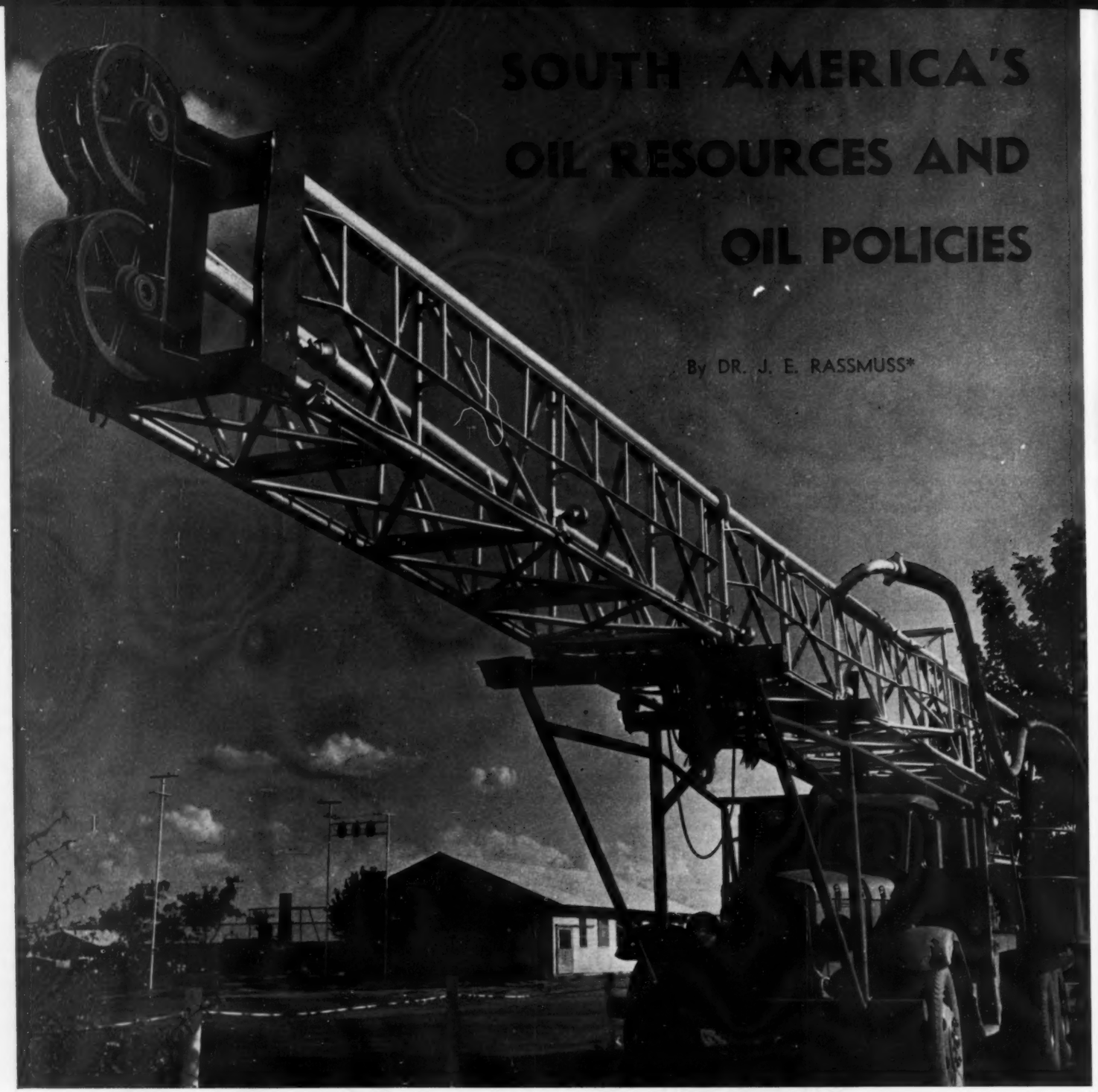


Fig. 2—Simplified flow diagram of crude distillation unit at The Texas Company's Port Arthur works which was reproduced in all essentials at Eagle Point.

Fig. 1—The map below suggests how the Eagle Point works may be expanded readily by building one or more additional plants at the left of the units numbered two to fifteen


EAGLE POINT WORKS
THE TEXAS COMPANY, WESTVILLE, N. J.
1. Main Office Building
2. Treating Unit Tankage
3. Treating Unit
4. Furfural Refining Unit
5. Thermal Reforming Unit
6. Catalytic Polymerization Unit
7. Cooling Tower #2 & Pump House
8. Cooling Tower #3 & Pump House
9. Liquified Fuel Storage
10. Fluid Catalytic Cracking Unit
11. Crude Distillation Unit
12. Cooling Tower #4 & 5 and Pump House
13. Barometric Water Settling Basin
14. Emergency Flare
15. Waste Oil Separator
16. Parking Lot
17. Employes' Building
18. Main Gate and Gate House
19. First Aid Building
20. Cafeteria
21. Laboratory
22. Foreman's Building
23. Central Fire Station
24. Cooling Tower #1 and Pump House
25. Boiler-Power House & Water Treating
26. Shop Buildings
27. Storehouse
28. Carpenter Shop
29. Marine Warehouse
30. River Water Pump House
31. Dock #3
32. Dock #2
33. Dock #1
34. Transfer Pump House #1
35. Main Tank Farm
36. Pressure Storage Tanks
37. Transfer Pump House #2 and T.E.L. Plant
38. Tank Car Loading Rack.
DELAWARE RIVER
North



SOUTH AMERICA'S OIL RESOURCES AND OIL POLICIES

By DR. J. E. RASSMUSS*

SCANNING a commercial map of South America, one observes certain facts concerning the oil situation of the different republics of this continent. The two biggest South American countries, Argentina with an area of 1,076,966 square miles and Brazil with 3,286,170 square miles (larger than the United States), are importers of petroleum. The same is true of Uruguay, located between them. Exporters of oil are Venezuela, Colombia, Peru and, on a minor scale, Ecuador. Countries that promise to be self-sustaining in the near future are Bolivia and Chile.

South America, excluding Trinidad, in 1948 supplied 554,635,000 barrels or 16.3 percent of world production, but production outside of Venezuela amounted only to 65 million barrels. The reserves of South America were estimated by Gester at 9.7 billion barrels, of which 8.8 billion are credited to Venezuela. Brazil's domestic consumption, with a population of 45 million inhabitants, can be estimated at about 20 million barrels, which, in view of the growing industrialization of the country and its great extent, must increase rapidly in future years.

Geologically Brazil consists in great part of a vast extension to the Brazilian shield, built up by crystalline rocks which exclude the presence of petroleum. From the geological map of oil possibilities in Brazil published by A. Ignacio de Oliveira in 1938,[1] crystalline rocks are shown outcropping over a surface of almost 5,000,000 square kilometers or are covered only by a light sheet of sedimentary beds, mostly of continental origin with no oil prospects. Some 24.7 percent of the surface is covered by sedimentary rocks, which may be interesting, and only 5.7 percent

* Consulting geologist, Lima, Peru.

of the surface is indicated as providing major possibilities for the existence of petroleum. Even the regions of sedimentary cover show generally only a moderate thickness of the beds. S. Fróes Abreu[2] has given more recently an interesting summary of actual knowledge of the oil possibilities in Brazil. The field of Reconcavi in the neighborhood of the city of Bahia, which is the only producing field at present, constitutes a Cretaceous "Graben," enclosed by crystalline rocks.[3] The Creatceous beds are folded and the oil found in anticlines, partly faulted. The production of the three fields of Candeias, Don Joao and Itapirica has increased from 2,083 barrels in 1940 to 143,405 barrels in the year 1948. The oil is of paraffin base and 26-30° API grade. In the gas field of Aratú light oil of 44° API is found. Up to the beginning of 1949 a total of 80 producing wells, 13 gas wells and 54 dry holes had been drilled. The proven reserves at that date were estimated at 17.8 million barrels. The thickness of the sedimentary sequence reaches almost 10,000 feet. Other sedimentary belts of Cretaceous and Tertiary beds on the coast farther north, in Sergipe and Rio Grande do Norte, and to the south in Marau, have been geologically and in part geophysically surveyed. The thickness of the sedimentary beds is estimated from 2,300 feet in Marau to 6,890 feet in Alagoas.

The permocarboniferous basin of the states Maranhão and Piauhy to the southeast of the state of Para, enclosed also by crystalline rocks, shows a thickness of sedimentary deposits of about 2,500 feet, which increases in the center and is considered promising.

One of the prospective but almost unexplored regions is the valley of the Amazon River. On Marajó island a sedimentary sequence of 10,000 feet thickness has been established. The sedimentary trough of carboniferous and Devonian rocks of the lower Amazon is still little known in detail. The petroleum value of the Cretaceous series in the Acre territory in the upper Amazon district, forming the continuation of the Montaña region in Peru, is questionable because, according to the exploration in the east of Peru, the basement of the Brazilian shield seems already to be uplifted in that region and the thickness of the beds, therefore, reduced.

In the sedimentary basin to the south in Parana in which the oil shales of the Iraty group of the Gondwana formation occur and also Devonian is exposed, no commercial oil has been found in the numerous wells drilled until now. The thickness of the sedimentary sequence, according to Abreu, reaches 5,000 feet. Oppenheim[4] calculates the total thickness of the beds of the Gondwana formation in the south of Brazil at about 1,500 meters (4,875 feet), of which 40-70 meters correspond to the oil-bearing rocks of the Iraty series, and he does not consider the stratigraphic conditions appropriate for an accumulation of oil in commercial quantity.

If we consider as a whole the oil possibilities of Brazil, we must admit that they are limited and that continuous work and heavy investments will be necessary to discover new reserves of commercial size. The cost of a thorough exploration of the country has been estimated at $300 million. According to present knowledge it will be difficult to develop sufficient oil resources to supply the consumption of this rapidly-growing country, and Brazil cannot be counted upon as a probable oil exporter.

To substitute the supply of natural petroleum sources, much attention has been lately paid in Brazil to the possibility of distilling oil shales, which occur in favorable economic locations, specially in the Tertiary beds of the Paraiba valley basin between Rio de Janeiro and Sao Paulo and in the Gondwana shales in Paraná. The Paraiba shales contain three to 50 gallons of oil per ton and are distilled for local use in Taubaté and Tremembé. The Conselho Nacional de Petroleo has ordered recently from the Foster Wheeler Corp. a plant for distilling about 200 barrels daily of gasoline, diesel and fuel oil.

The Iraty shales in the south of the country, 100 to 200 feet thick and with an average content of 23 gallons per ton of sulfurous oil of 19° API gravity, are considered because of their large tonnage to afford the largest reserves of petroliferous material.

Uruguay had in 1948 a domestic consumption of 5,427,256 barrels. The oil possibilities of the country are slight. Crystalline and igneous rocks are exposed in a broad extension on the surface. In the northwestern region, reaching to the frontier of Brazil, is an extension of the Gondwana basin, covered partly by the extrusive rocks of the Sierra Geral series. A North American geological commission engaged by the government is surveying the oil possibilities of the country.

Argentina, with a production of nearly 23 million barrels last year, provides about 40 percent of its consumption. Current domestic demand is estimated at 155,000 barrels daily and a continuous, rapid increase is indicated by the great industrial development of the country and its lack of other sources of energy such as coal or hydraulic power.

Argentine oil is found in four different petroleum provinces.[5] Cretaceous deposits of the Comodoro Rivadavia fields supplied about 16 million barrels or 70 percent of the national production in 1948. The Rhaetic basin of Mendoza follows with 3.1 million barrels, but the productive field includes in its southern part a continuation of the Jurassic province of Neuquen, which produced in 1948 about 2.7 million barrels. The petroleum province of Salta, producing from the Gondwana formation specifically from old glacial deposits of Permian age and from the Devonian, which is the source bed in the neighboring region of Bolivia, has added roundly a million barrels to total production. The present oil reserves of Argentina are estimated by Gester from 253 to 325 million barrels.

Looking to future sources of petroleum production, it may be noted that in Comodoro Rivadavia discovery of the Caleta Olivia field is a valuable addition to reserves; the Mendoza field undoubtedly has still considerable possibilities; in the north the western Chaco, adjoining the Salta province, has not yet been drilled. To the east of the southern Andes the broad basin north of the Chubut Massif and the part of Patagonia lying to the south of the Santa Cruz Massif, offer interesting prospects.[6] In Tierra del Fuego the first well of YPF near San Sebastian struck a large quantity of gas.

Considering the oil resources of Argentina as a whole, the logical conclusion is that there still exist ample possibilities, but strenuous efforts will be needed to satisfy the future domestic demand, and it is not probable that sufficient reserves will be found to produce an exportable surplus.

In Paraguay exploration by the Union Oil Co. of California has met with no success thus far, and the prospect of finding substantial production is not considered encouraging.

By the discovery of oil in 1945 in Cerro Manantiales in Tierra del Fuego, Chile entered the ranks of producers. In Magallanes[7] the thickness of the Cretaceous and Tertiary marine deposits exceeds 11,000 meters (24,750 feet) covered by 2,000 meters of non-marine Tertiary. In the wells of Cerro Manantiales, which is located on the eastern border of the basin, 2,200 meters of sediments have been drilled. The underlying oil sand of 10 to 30 meters covers the Serie Tobiferá, considered of Jurassic age, of which about 1,000 meters have been drilled in well No. 2. The isopachs of the marine deposits diminish to the east, to the Argentine frontier. Twenty wells have been drilled on the Manantiales structure, two on the San Sebastian anticline and two in Espora. Because of the great sedimentary thickness, the existence of appropriate sandstones as reservoir beds and the presence of favorable structures, the petroleum province of Magallanes offers good prospects and a production of 10 to 12,000 barrels daily is foreseen for the near future. It is possible that this field can supply the future domestic demand of Chile, but a surplus for export can hardly be expected. Other prospective regions for commercial production are not known in Chile, and the oil-bearing series of Atacama is probably too thin for a commercial accumulation.

In Bolivia the fields on the eastern front of the Cordillera produced 463,500 barrels in 1948. Domestic consumption amounted to 442,885 barrels in the same year. By the construction of pipelines from the Camiri field to Cochabamba and Sucre, where refineries of 5,000 and 3,000 barrels daily capacity are located, the oil can be transported to the consuming centers of the Bolivian Altiplano. The reserves of this petroleum province, with source beds in the Devonian, may still be considerably increased, but by its geographical situation, separated from the Pacific coast by the broad and high ranges of three cordilleras, its importance is restricted to the local demand of Bolivia and neighboring regions of Argentina and Brazil. Bolivia's highest attainable goal probably is that of becoming a self-sustaining country.

With an output of roundly 490 million barrels

Socony-Vacuum Oil Co. well in the Barinas area of Venezuela.

in 1948, Venezuela not only held first place in South America but was the second largest producer of the world. Its proved reserves of 9,000 million barrels, 11.4 percent of world reserves, are surpassed only by those of the Middle East and the United States. Development of the deposits in the Cretaceous limestones, with a yield of 10,000 barrels per well daily, and the exploration of new deposits in the Apure basin will increase its reserves still further. Consumption of the country amounts only to 1.7 percent of its production, which, after a reduction early in 1949, is again reaching its former peak. The geographic situation of Venezuela is particularly convenient for export to the United States, and its heavy crudes have their biggest market on the Atlantic coast of that country.

Colombia, the second producer of South America with 24,371,262 barrels in 1948, expects 1949 to show a substantial increase when statistics are compiled. Of its six petroleum provinces[8] the Tertiary basin of the Middle Magdalena, with deposits in the Eocene and Oligocene in faulted anticlines and trustfolds, has supplied the bulk of Colombian production. The Casabe field of Shell in the same region is increasing its output. The Cretaceous-Tertiary province, southwest of Lake Maracaibo where the Barco concession is located, with high-grade oil deposits in Lower Cretaceous limestones and lower grade oil in the Eocene, holds second position. The third petroleum province, with its prevailing development of marine tertiary, embraces the region of the lower valleys to the northern coast of Colombia. It produces oil in the Dificil field and holds promise of additional growth. The fourth and largest province, which comprises the Llanos east of the Cordillera, is still in the exploration stage. The fifth, the basin of the Atrato valley with seepages in Lower Tertiary, and the sixth, the Tertiary coastal plain on the southern Pacific coast, which forms the continuation of the Tertiary of Ecuador's coast, are considered less important. The cumulative production of Colombia amounts to 450 million barrels, and its reserves are estimated by Gester at 470-580 million barrels. With great areas still unexplored, Colombia must be classed as having important potentialities.

Ecuador, although its current production amounts only to 2,610,219 barrels, is an oil exporting country, its shipments going largely to Argentina. Production proceeds exclusively from the fields of the peninsula of Sta. Ela and is from Tertiary, principally Eocene deposits. Exploration of the Tertiary belt, which outcrops on the coast to the north adjoining Colombian territory, notwithstanding investments of $22 million by the International Petroleum Co., has been unproductive. The Oriente region, east of the Cordillera, which is a continuation of the petroleum province of the Peruvian Montana, is being tested at present by an association of Shell and Standard Oil Co. of New Jersey, and the construction of a trans-Andean pipeline to an Ecuadorean port on the Pacific is provided for in the concession contract. Ecuador must be counted among the possible producers of major quantities of crude in the future.

Peru had a production of 15,157,433 barrels (including casinghead gasoline) in 1948 and takes the fourth place among the producers of the South American continent. About 50 percent or 7,204,165 barrels were consumed in Peru.

The oil resources should permit a much higher output but development has been handicapped by lack of a progressive oil policy. The cumulative production of the few developed areas reached 370 million barrels, approximating that of Argentina and Colombia.

The petroleum province of the northern coast produces oil from the marine Eocene and, probably in the secondary deposit of Zorritos, from Miocene sandstones. The marine Tertiary of the coastal plain has a total thickness of 20,000 feet. The prospective area aggregates about three million hectares (7,400,000 acres) and the Sechura concession alone has two million hectares which are not yet tested.

The belt of marine Tertiary south of Lima in the Ica region does not offer encouraging prospects because of the reduced thickness of the series. The Pirin field on the shore of Lake Titicaca, 3,900 meters in altitude, has only local interest.

The most important petroleum province of Peru is the Amazonas basin, called Montaña. The sedimentary thickness of the Cretaceous and Tertiary beds amounts to 20,000 feet. The extension and importance of the underlying Permian limestones, of which 1,600 feet have been drilled in Ganso Azul's well No. 1, is practically unknown. The Montaña, with an area of 60 million hectares, located between the Cordillera and the Brazilian shield, corresponds in its situation to the new Canadian fields between the Rocky Mountains and the Canadian shield. The yield of the wells, according to the experience of the small Ganso Azul dome, is much larger along the coast and can be estimated at 500 barrels daily per well in average. A production of 100,000 barrels daily or more is not improbable for that region because of the large prospective areas and the probable high yield of the wells. The geographical situation, although requiring for its development heavy investments, estimated at $250 million, offers a practicable outlet by a pipeline to the Pacific. The length of the trunkline of 300 miles from the Marañon river to Bayovar on the Pacific and the height of 9,000 feet in the Porculla pass, do not present serious obstacles to modern technique, and its route already has been studied. For smaller quantities, river transport to Iquitos, which may in future become an important port for the export of oil to the Atlantic, opens a second, although more expensive, way for shipping.

Peru, therefore, must be counted as one of the South American countries which has possibilities for oil export on a much larger scale.

A survey of the oil policies of the several South American countries immediately establishes one clear division. The oil-importing countries have adopted a nationalistic policy, establishing generally a state monopoly for production. The oil-exporting countries have followed a more liberal line, accepting the cooperation of outside capital in all branches of the oil industry.

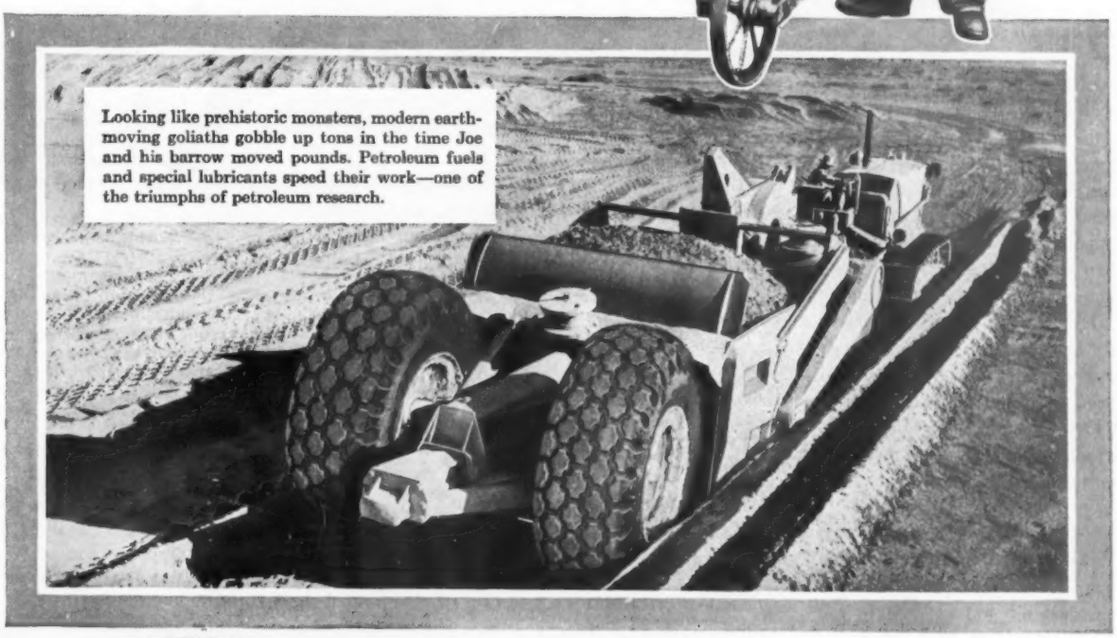
Oil exploitation is completely state-operated in Bolivia and Chile. In Bolivia the YPF Bolivanos handles production, transport by pipeline and refining in the new refineries. In Chile the government, through the Corporacion de Fomento, has started exploration and development of the southern fields, reserved the right of refining and by Law No. 5124 enables the state alone or in association with national companies to control the import, distribution and selling of petroleum, which right it has not exercised so far.

In Uruguay where no crude is produced, refining is operated by the government refinery of ANCAP.

(Please turn to Page 42)

Its Grand-Dad was a Wheelbarrow !

How Petroleum Research helps the Engineer Contractor



Looking like prehistoric monsters, modern earth-moving goliaths gobble up tons in the time Joe and his barrow moved pounds. Petroleum fuels and special lubricants speed their work—one of the triumphs of petroleum research.

Digging sand, laying concrete, breaking rock, excavating and construction machines must be lubricated to withstand exposure to heavy strain, shock, dust, mud and abrasives.

Giant power shovels, buckets, scrapers, bulldozers, literally move mountains to span the nation with roads, build dams, levees and foundations. By its research in improving gasoline engine performance, in providing lubricants that helped make the Diesel engine practical and economical, by providing efficient machine lubricants to operate under the severe conditions of mud, water, sand, heavy loads and shock, the petroleum industry has contributed to their achievements—a field in which Texaco has played a vitally important part.

THE TEXAS COMPANY

Petroleum Promotes Progress

TEXACO

In Argentina exploration is reserved for the government which, through the YPF, controls also about 60 percent of the production and fixes the prices of products. Expropriation of the still existing private companies and the total nationalization is considered only a question of time and is anticipated by Article 40 of the new Constitution, published in 1949 and mentioned also by President Perón in a recent speech to the laborers of YPF. Import of petroleum is fiscalized by the government in the Argentine-British and Argentine-Peruvian trade agreements of last year, which establish the quota and origin of oil imports.

In Brazil foreign oil companies are not allowed to obtain concessions, and the Conselho Nacional de Petroleo, created in 1938, has a virtual monopoly, which it exercises in developing the Bahia fields and in making explorations in various regions of the country. Military circles at one side and the left-wing parties on the other have insisted on requiring nationalization and state monopoly, and more liberal projects of new legislation have not succeeded so far. It seems probable, however, that the stress of dollar need may bring about a compromise which will permit the cooperation of outside capital, but it will depend on the provisions of the projected law whether a practical result can be obtained.

In the second group, which comprises the oil-exporting countries, Venezuela, by legislative enactments, has attracted the investment of foreign oil capital, the amount of which is calculated at more than two billion dollars at present.[9] About 30 companies have obtained concessions, but 12 of these are responsible for most of the activity. Through the relative freedom of private enterprise and competition, oil development of the country has been enormous. Production during the years 1943-1948 rose from 400,000 to 1,340,000 barrels daily, and the government has received $1,130 million in the past six years from royalty and taxes.

Sixty percent of the crude produced in Venezuela is of heavy grade, suited especially to the making of residual fuel oil and exposed to the competition of other fuels such as natural gas and coal. Middle East oil, because of its low producing cost, is held to offer potentially serious competition, but with the sound foundation of the industry which has accumulated large reserves in past years, it is believed that Venezuela can meet competition and keep its place in the world market.

In Colombia, although it is credited with important oil resources, development of the petroleum industry has been much slower. This, no doubt, is due in part to natural conditions since the principal producing fields, such as Barranca Bermeja, Casabe and the Barco concession, are distant from the coast, and the Llanos region, which embraces about 50 percent of the area available for prospecting, is difficult of access. A deterrent factor also has been that the laws are less inviting to capital and the administrative procedures are slow and embarrassing.[10] Numerous new projects of law have been presented in the past seven years, but none has been approved by Congress. Increase of production cost, taxes and labor relations have lately hampered development, and several foreign companies have retired from the country. Creation of a Colombian YPF for exploitation of the Mares concession in 1951 presents a new element of insecurity to free competition, indispensable for sound development of the industry.

In Ecuador the favorable conditions of the new concession for the Ecuadorian Oriente will facilitate the exploration of a vast region which, because of its geographical situation and the high necessary investment, might otherwise have been postponed indefinitely, and it may afford an important contribution to the nation's economy.

Due to internal political struggles, Peru, which offers ample prospects, has been closed to private capital during the time of strongest demand and rapid oil development following the end of the war. Because of the change in the world situation, which by development of the Middle East and Canada has reached an actual superabundance of oil, the conditions of the oil law certainly require readjustment. The military government has faced the solution of this problem, and its declaration of September 15, 1949, announced its policy to open the country to private national and outside capital, assuring full protection and guarantees. The state-operated Empresa Petrolera Fiscal, which supplied only one percent of national production, was dissolved as an autonomous enterprise and reduced to a dependent of the petroleum division of the Ministry of Development, created simultaneously. In his message to the nation, the President on October 27 reiterated his promise that private capital in the petroleum industry will enjoy the most ample guaranties and facilities. Publication of the respective decree-law was announced for the near future and will offer in the meantime the legal basis for companies to start preliminary steps of exploration.

Viewing broadly the possibilities of new development in South America by North American capital, it appears that Argentina, Chile, Bolivia and Uruguay are closed by their established policies and legislation. In Venezuela new concessions have not been granted since 1946, but it is stated that further grants will be issued shortly. The idea of creating a state enterprise seems to have been abandoned, and only a private national company has been formed recently. In Colombia the interest of private investors seems to have been discouraged by conditions previously stated but may be revived by adoption of progressive laws. In Brazil foreign investments are excluded until the legal position is defined. In every case the risks will be considerable because of the geological constitution of the subsoil and must be compensated by appropriate provisions.

On the Pacific side of the continent Peru offers the best possibilities of early development. In the north there still exist large prospective areas on the coast and on the submarine shelf, and the Montaña encloses possibly one of the most important reserves in South America.

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Unloading 6-inch casing at Socony-Vacuum Oil Company's Anaco warehouse in Venezuela.

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International News and Notes

W. D. Heath Eves

Represents Anglo-Iranian in U. S.

W. D. Heath Eves has been appointed representative of the Anglo-Iranian Oil Co. in the United States. Mr. Heath Eves has been in charge of the New York office since B. R. Jackson returned to England in April last to take his seat on the board of the Anglo-Iranian Oil Co.

After leaving Cambridge University, England, where he obtained an Honors Degree in geology and mineralogy, Mr. Heath Eves joined the Shell group, for whom he worked in London and California until the outbreak of war in 1939. He then returned to England where he joined the British Navy and served afloat until April 1943, when he joined the staff of the British Naval Delegation in the U.S.A.

After the war Mr. Heath Eves was appointed assistant to the general manager of the British Tanker Co. in London, a wholly owned subsidiary of the Anglo-Iranian. In June 1948 he joined the New York office of Anglo-Iranian and was appointed deputy to Mr. Jackson.

Ready Built Town Shipped to Argentina

A feature of the Building Exhibition held at Olympia, London, during the second half of November which attracted much attention was the display by Almin Ltd. of transportable and permanent houses constructed by Structural and Mechanical Engineers Ltd. of Slough, employing aluminum alloy materials. A complete "town" of these buildings, including bungalows, workshops, dining rooms, cinemas and other structures was shipped to Argentina in October last for the use of the government's oil department. In this case the buildings were constructed for permanent occupancy but so built that they can be moved from one point to another as circumstances may require.

Launch New Tanker

The British Tanker Company's new ship, The British Commander, was launched from the Govan yard of Harland Wolff Ltd. on Nov. 21. This is the second of three tankers placed with the Goven yard under the British Tanker Company's third postwar program which gave seven tankers to Clyde yards.

N. A. Gass, director of the Anglo-Iranian Oil Co., said that the British Tanker Co. fleet consists now of 127 ships of rather more than 1,500,000 tons deadweight, as against less than 1,000,000 tons prewar.

A. G. Chandler

Joins Reed's Foreign Division

Transfer of A. G. Chandler to the foreign division of the Reed Roller Bit Company has been announced. Mr. Chandler was formerly Gulf Coast division manager for Reed. Concurrently with the transfer, Mr. Chandler left for New York where he will work with Howard Book, head of the export division of Reed. He will shortly leave for an extensive trip to London, The Hague, Paris, Rome, Egypt, the Middle East, India - Pakistan, the Netherland East Indies and Australia.

To Build Two Lake Tankers

Pipe Line Tankers Ltd., Toronto, Canada, has ordered two 15,800-ton lake tankers to carry Alberta crude from the head of the lakes to Sarnia and other Ontario refining points. They will be roughly twice as large as any tanker now operating on the Great Lakes. Contracts have been awarded to the Port Arthur Shipbuilding Co. Ltd. and Collingwood Shipyards Ltd. The ships will be built for Pipe Line Tankers Ltd., a newly organized company, and Imperial Oil will charter them for 15 years. Total construction cost will be about $7.8 million.

Each of the new ships will have a capacity of approximately 115,000 barrels of oil. Service speed will be 13 knots, enabling the ships to make a round trip between Sarnia and Superior in five days. Each tanker is expected to carry about five million barrels of oil in a season. Dimensions are: length, 620 feet; beam, 68 feet; depth, 35 feet. Engines will be 4,500-horsepower geared turbines. Navigation aids of the latest design will include radar, gyrocompass, direction finder, fathometer and ship-to-shore radio telephone. Modern pumps will give each ship a discharge capacity of 15,000 barrels an hour, and similar equipment at the Superior terminal will load them at the rate of 20,000 barrels an hour.

New Canadian Refinery

British American Oil Co. will erect a 5,500-barrel refinery on a 160-acre site near Edmonton, Alberta, according to an announcement by M. S. Beringer, vice president of manufacturing. It is estimated that between 500 and 600 employees will be needed during the 12 or 14 month construction period beginning early next spring.

The Edmonton refinery will be the latest addition to B-A's rapidly expanding Alberta holdings. Already in operation are a refinery at Calgary; an absorption plant and the first gas recycling plant in Canada, both in Turner Valley; and the B-A Alberta Pipe Line Limited. British American wholly owns or has a participating interest in 54 wells and has assisted in the financing of many more. The company has three seismic survey operations in progress, holds several government reservations and has considerable freehold acreage mineral rights. B-A's total investment in the Alberta oil industry to date is in excess of $19 million.

Outlook in Burma

Prospects of improved conditions in the oil industry in Burma have not materialized over the past year, according to A. P. Faickney, chairman of the British Burma Petroleum Co. Ltd. Although it is impossible to forecast the outcome of the situation, the Burma Oil Co. Ltd. and the Indo-Burma Petroleum Co. Ltd. are preparing plans for the reconstruction of the oil industry in that country, subject to the help of the Burmese government.

Oil Refineries for Brazil

A special session of the National Security Council on November 14 approved the concessions granted in 1946 to Messrs. Soares Sampaio and Drault Ernani to install oil refineries with capacity of 20,000 and 10,000 barrels daily in Sao Paulo and the Federal District, respectively. The meeting was presided over by the President of the Republic and attended by the heads of the various ministries, the president of the Bank of Brazil and the Commanders of the Army, Navy and Air Force.

Latin American Representative

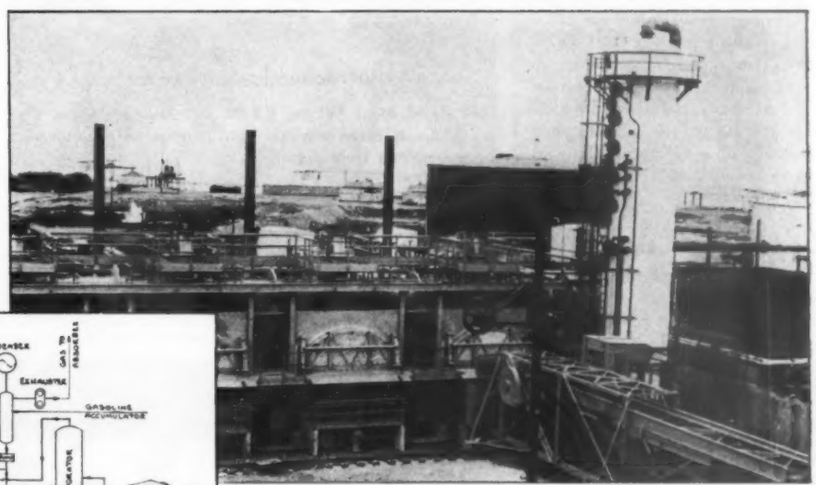
F. L. Cuilty recently joined the staff of Independent Exploration Co., Houston, as foreign relations representative for Latin America. His office will be in Mexico City. Mr. Cuilty served the Doheny interests in Mexico, where he was assigned to the Huasteca Petroleum Co. and the Mexican Petroleum Co. of Calif. Later he joined Standard Oil Co. (N.J.), serving in New York and London and specializing in Latin American business.

Just prior to the outbreak of World War II, Standard loaned Mr. Cuilty to the United States government to serve on oil committees. After Pearl Harbor he was commissioned as Lieutenant Commander in the U. S. Navy. He returned to Mexico after the war to engage in private business until joining Independent Exploration Co.

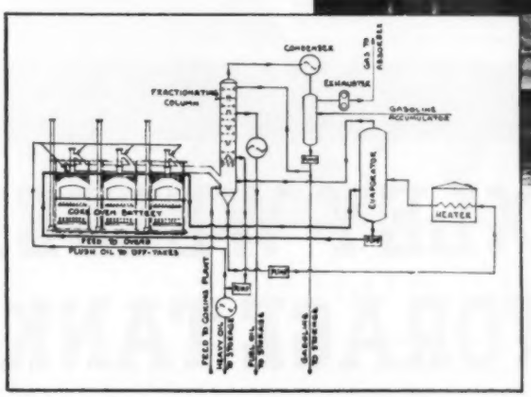
F. L. Cuilty

PROBLEM: **How to Profitably Convert Residuums to Metallurgical Coke or Electrode Carbon**

SOLUTION: **Curran Carbonizing Process: A flexible and economical method of high temperature coking**



Curran Liquid Hydro-Carbon Coking Plant



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Morgan Walker

Consultant to Iraq Petroleum

Morgan Walker of the New York engineering firm of Adoue & Walker has been appointed as consultant to Iraq Petroleum Co. Ltd., succeeding the late H. S. Austin. A graduate of Oklahoma A and M College, Mr. Walker has had broad experience in the petroleum field, first with the Bureau of Mines and later with oil companies in the United States and South America. For several years he was connected with foreign field operations of Standard Oil Co. (N. J.) and left that position in 1944 to join the Bechtel Corporation in charge of its Venezuelan subsidiary.

Brazil Debating Oil Law

Demand for some positive action in the direction of a revision of the existing petroleum law is growing in Brazil. The subject has been before Congress since February 1948 and has raised a heated controversy between the advocates of amendments that would encourage the investment of outside capital and the Nationalists and Communists who insist that control of all petroleum activities be retained by the government or limited to companies made up exclusively of Brazilians.

The latest proposal, submitted by Deputy Amando Fontes, provides for the establishment of a mixed company to be organized by the executive power to handle every phase of the industry, operating as a public utility. The name of the company would be "National Petroleum Deposits S.A.," and it would have a capital of 5,000 million cruzeiros ($270,000,000 U.S.), of which 51 percent would be subscribed by the national treasury which also would contribute any balance not subscribed by the states, municipalities, autonomous departments and the Brazilian public. The company would pay to the government a royalty of 10 percent of all the crude oil produced.

It is not expected that the project will receive favorable consideration, as so-called mixed companies are not in good odor in Brazil at present, but debate on it may delay final decision on changes in the petroleum laws.

Petrochemicals Director

Lewis Gilmour Whyte, F.F.A., has been appointed a director of Petrochemicals Ltd., London, manufacturer of chemicals from petroleum.

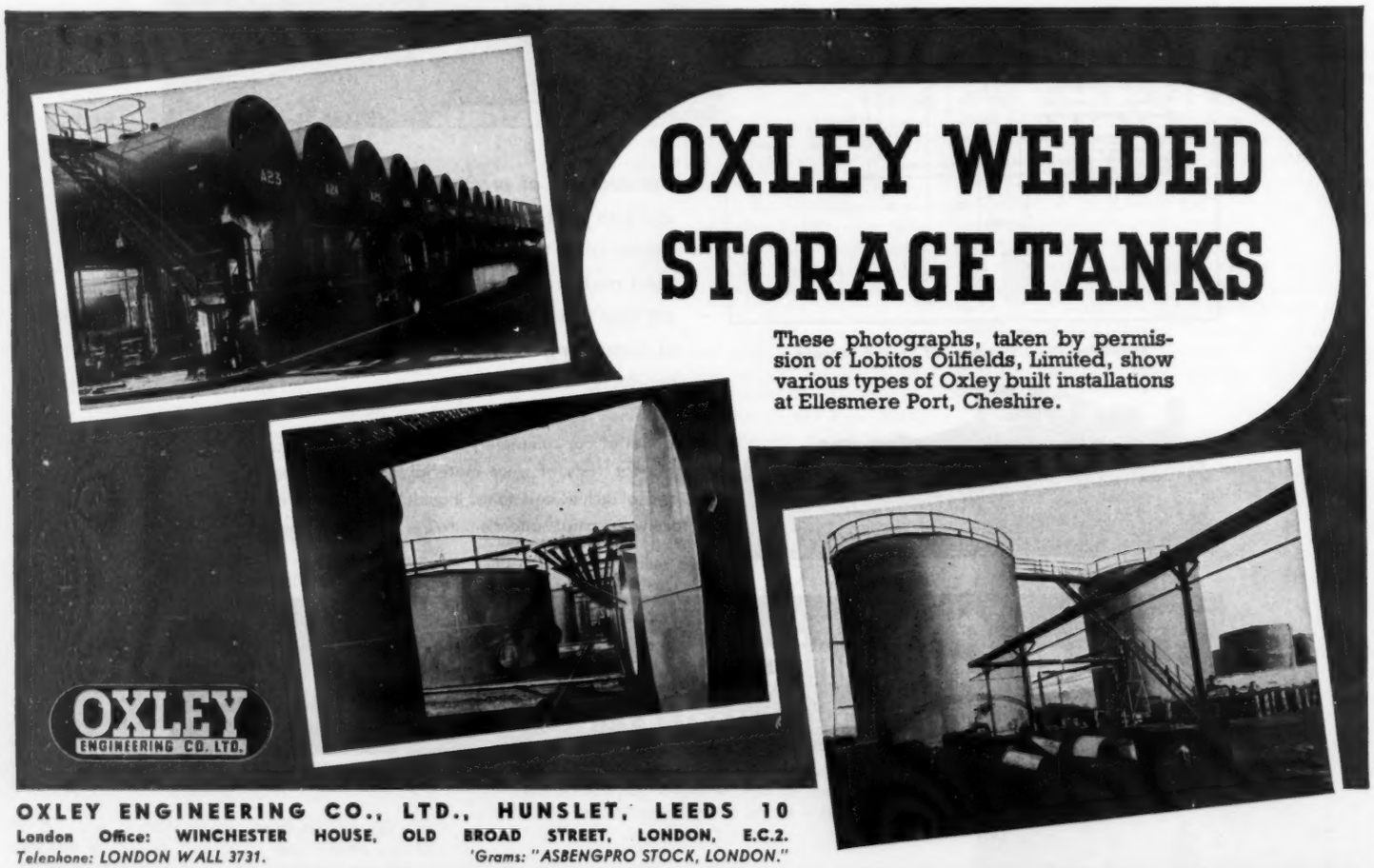
Sells Foothills and Lowery Interests

Federated Petroleums Ltd. of Calgary have purchased Imperial Oil's entire interest in Foothills Oil and Gas Co. Ltd. and in Lowery Petroleums Ltd. Imperial's interest in Foothills amounted to 1,181,805 shares, representing 80.8 percent of the outstanding stock. The sale of Foothills carried with it the controlling interest in Southwest Petroleums, its subsidiary, as Foothills owned 470,506 shares or 62.7 percent of the issued stock. Imperial's interest in Lowery was 770,005 shares, representing 77 percent of the issued stock.

New Aramco Diesel Workboats

The Arabian American Oil Co. has recently placed in operation on the Persian Gulf a fleet of high-speed diesel workboats. Built by Fellows and Stewart at Terminal Island, Calif., and designed by Dair N. Long, the new boats are of welded steel construction, powered with twin GM diesels of 200 hp. which, driving through two to one reduction gears, give them a cruising speed of 14.5 knots.

Two of the new Aramco fleet are 60-foot personnel boats with a capacity of 81 seated passengers, one is a staff personnel boat with enclosed cabin that seats 54 passengers, and two are unique multi-purpose craft 65 feet overall. The 60-footers will operate between Ras Tanura and Bahrein, carrying passengers, light supplies and baggage. The 65-footers will serve as fire, pilot and tug boats wherever needed.


OXLEY WELDED
STORAGE TANKS
These photographs, taken by permission of Lobitos Oilfields, Limited, show various types of Oxley built installations at Ellesmere Port, Cheshire.
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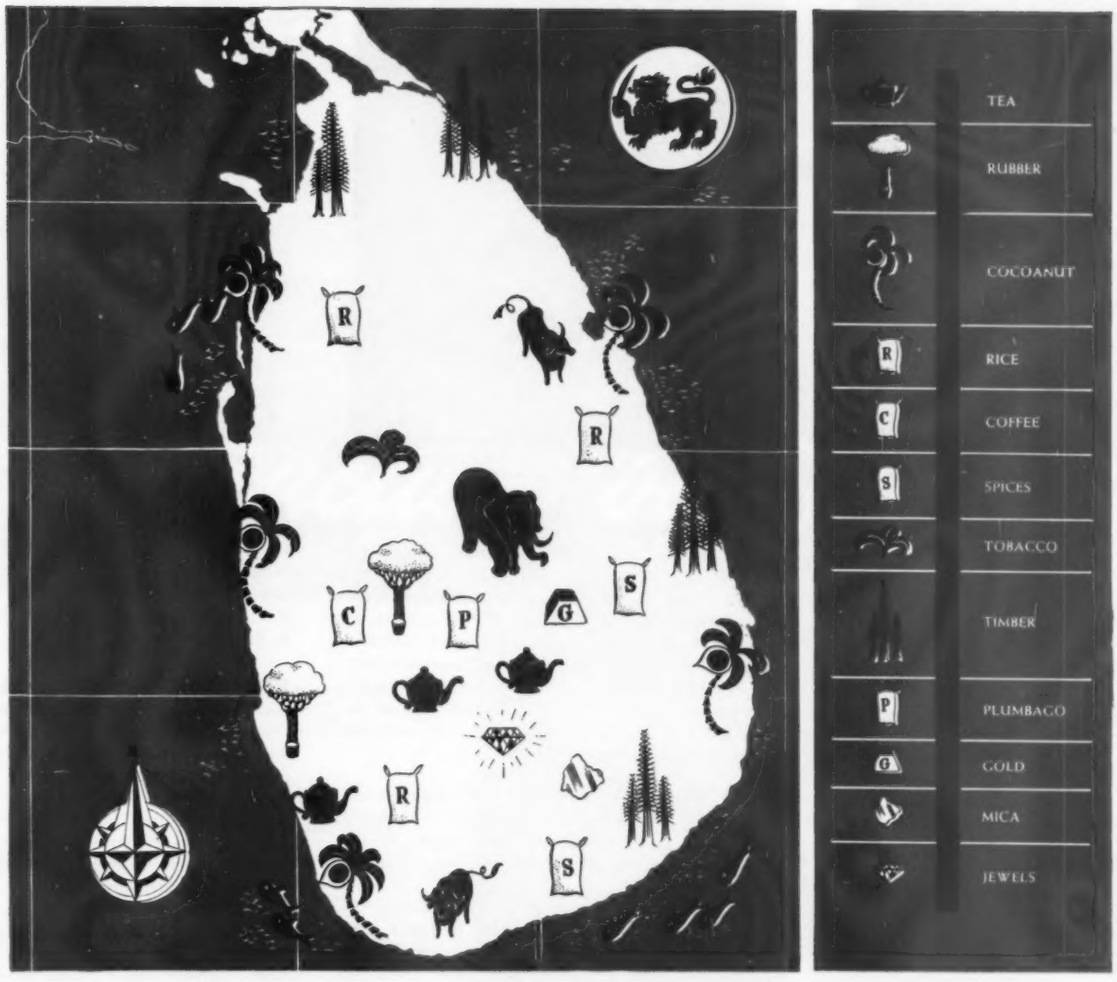

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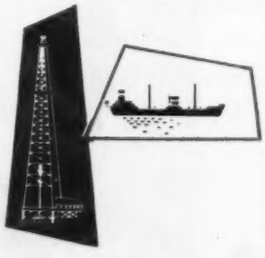

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OIL COMPANY STAFF CHANGES

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William H. Pinckard

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William F. Bramstedt

HOWARD MARVIN HERRON, chairman of the Bahrein Petroleum Co. Limited and of California Texas Oil Company Limited, has been elected chairman of the executive committee effective Jan. 1, 1950. He will continue as a director. William Henderson Pinckard, former president, advanced to chairman and chief executive officer of the Bahrein-Caltex group of companies. William Frederick Bramstedt, director and executive vice president, became president of the group.

Mr. Pinckard started in the oil business in 1917 and after several months at the Port Arthur refinery was transferred to Manila, P. I. He continued his work in the Philippines and then in China, until in 1936 he was made managing director in Australia. Shortly after he went to India for two years to organize Caltex (India) Limited. Since 1946 he has been president of the Bahrein-Caltex group of companies.

Mr. Bramstedt graduated in 1926 from the University of California with a degree in mechanical engineering, and initially worked on the construction and maintenance of refinery equipment. From 1940 to 1943 he was vice president and director in charge of refining and marine transportation for the Standard Oil Co. of British Columbia, which is the Canadian subsidiary of Standard of California. He was project manager in the field as well as vice president and director for the contractor to the War Department in operation and maintenance of the Canol refinery and pipeline system, with headquarters in White Horse, Yukon Territory. Since 1946 he has been entirely concerned with overseas operations and has made six trips to other continents. Mr. Bramstedt was president of Mid-East Crude Sales Co. Limited before his election to executive vice president of the Bahrein-Caltex group.

FRED G. CROSBY has been appointed assistant to the managing director of Sun Oil Company Ltd., Canadian marketing subsidiary of Sun Oil Co. Mr. Crosby moves to the company's regional headquarters at Toronto after seven years as manager of the London, Ontario, marketing district.

Heads Welding Fittings Division

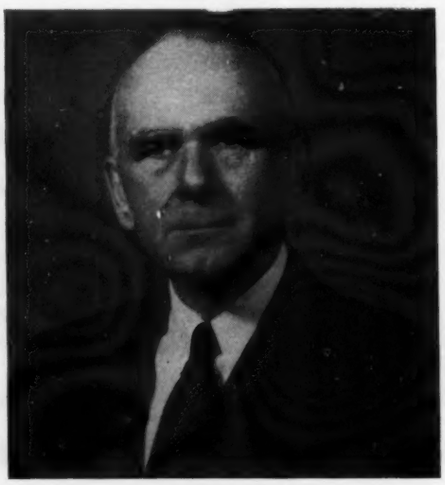
Phil R. Becker has been appointed sales manager of the welding fittings division of Midwest Piping & Supply Co. Inc. Mr. Becker joined the Midwest firm ten years ago and worked for two years in the engineering department on detailing and designing on fabricated piping and coils. Since 1945 he has devoted his entire time to sales in the welding fittings division.

R. E. NELSON JR. has been appointed general manager of crude oil supply and products pipelines for Standard Oil Co. (Ind.), effective Jan. 1, 1950. For the past six months Mr. Nelson has been assistant to the president of Stanolind Pipe Line Co., and for the preceding 20 years he was connected with Stanolind Oil and Gas Co. of Tulsa in various executive positions. He succeeds Bruce C. Clardy, who has resigned to return to Texas and resume his activities as an independent oil operator. Mr. Nelson will make his headquarters in Chicago.

N. VAN WINGEN, vice president of Petroleum Technologists Inc., Montebello, Calif., has been elected chairman of the Pacific Petroleum Chapter of the American Institute of Mechanical Engineers.

W. F. DUNNING, manager of Standard-Vacuum Oil Company's marine department, retired on Jan. 1 after a 40-year career in shipping and transportation. With the Santa Fe railroad prior to World War I and the U.S. War Shipping Board from 1918 to 1920, Mr. Dunning has been in the oil industry for the past 28 years. He joined Standard-Vacuum in 1934 in his present position and served during World War II as chairman of the Near East-Far East supply and distribution committee of the Petroleum Administration for War. J. M. B. Howard, assistant marine department manager since 1948, succeeds Mr. Dunning as head of the Stanvac tanker fleet.

W. F. Dunning



Appoints Export Representative

D. T. O'Connor, formerly with Edward Carter, has formed his own company and has been appointed to represent Frank Wheatly Pump & Valve Mfg. products in foreign markets, according to Frank Wheatley, Jr., executive vice president of the firm. In addition to the Wheatley line, Mr. O'Connor will repreesnt Shaffer Tool Works, M. J. Crose Mfg., Mayhew Machine and Drilling & Service, Inc.

Elected ASME Fellow

Paul R. Duffey, power engineer for The Youngstown Sheet and Tube Co., has been elected a "Fellow" of the American Society of Mechanical Engineers. This is an outstanding honor, for there are only 284 "Fellows" in the entire membership of 31,000. It is bestowed on an outstanding member who has qualified as a nominee and who has acknowledged engineering attainment—25 years of active practice in the profession of engineering, and who has been an active member of the society for 13 years.

J. E. BEALE, manager of the New York City marine sales division of Socony-Vacuum Oil Co. Inc., has been made special representative of the marine sales department at New York. He will assist the domestic sales manager of the department. He is succeeded by R. C. Schnepf, who has been division marine manager in Baltimore.

BERT PERSING NEWTON, vice president in charge of foreign marketing operations for Gulf Oil Corp., retired Dec. 31, 1949, after 25 years' service, the greater part of them spent abroad. Mr. Newton took charge of Gulf's European marketing operations in 1932 and was elected vice president.

Three foreign governments have conferred high honors upon him for distinguished services rendered them. Belgium presented him the Order of Leopold I, personally conferred by Leopold III, King of the Belgians (1936); from Brazil he received the Order of the Cruzeiro do Sol (Southern Cross), Comendador Grade (1946); and Finland honored him with The Order of the Lion of Finland, with the rank of Commander (1946).

Mr. Newton first joined Gulf in 1921 as manager of its tax department, remaining until 1928 when he became vice president and comptroller of the Standard Steel Car Company. In 1932 he returned to Gulf, accepting the European marketing assignments with headquarters in Antwerp, Belgium.

B. P. Newton

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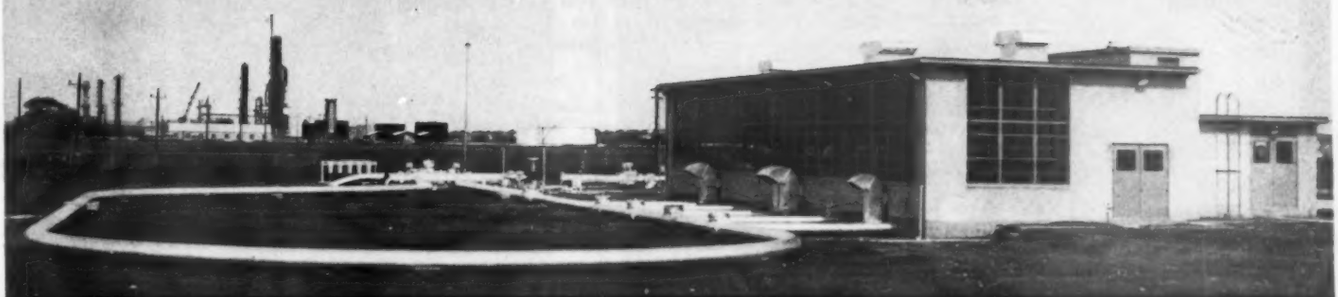

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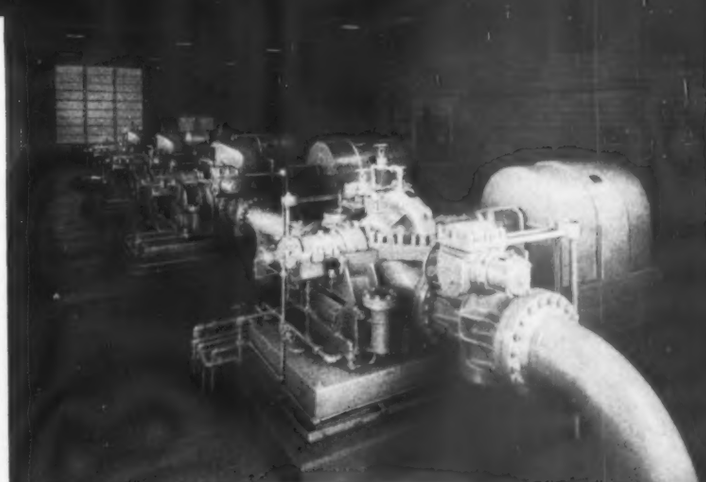

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B. Bynum Turner

Ethyl Promotes B. Bynum Turner

B. Bynum Turner has been appointed general manager of manufacturing for Ethyl Corp. in charge of the company's activities in Baton Rouge, La., the home of its antiknock manufacturing plant. He will relieve John H. Schaefer, vice president and director, who returns to the New York office to direct all manufacturing operations from the company's headquarters. Clinton W. Bond will continue as resident manager in charge of the plant at Baton Rouge. Mr. Turner for the last two years has been coordinator of the $40 million plant expansion program which is now completed.

Announces Road Conditions

In the interest of the safety of its employees returning home, Sun Shipbuilding and Dry Dock Co. each day supplies the latest information about highway conditions in the Philadelphia metropolitan area. Just as the men are leaving the shipyard at 4:30 PM, the loud speaker system notifies drivers of cars just what to expect. The service, which was inaugurated Dec. 1 by Vice President John G. Pew Jr., will continue until late in April next.

Named General Service Manager

The promotion of Earl G. Ellis to general service manager has been announced from the Fort Worth headquarters of Cummins Sales & Service Inc., by J. E. Everroad, president and general manager. Mr. Ellis formerly was export service manager stationed at Caracas, Venezuela. He has been with the company since 1941 and went to New York as export service manager in 1947, leaving from there for Venezuela.

Earl G. Ellis

UOP Elects Venema Vice President

M. P. Venema, formerly head of the company's patent department, was elected a vice president of Universal Oil Products Co. at a recent meeting of the board of directors. A graduate of Armour Institute of Technology (now Illinois Institute of Technology) and Georgetown University in law, Mr. Venema has been associated with Universal since 1935. From 1941-44 he represented Universal's patent department in Washington and in June of the latter year returned to Chicago to direct the activities of that department a position he held until elected vice president.

In addition to electing Mr. Venema a vice president the directors also elected George A. Bockman treasurer and Frank X. Pillert assistant treasurer. Mr. Bockman was formerly assistant treasurer and has been with Universal since 1922. At one time he served as purchasing agent of the company and was made assistant treasurer in 1941.

New Guiberson Appointments

R. W. (Ace) Elliott, who has formerly been associated with Hughes Tool Co., Oil Center Tool Co., and Hughes Supply Co. Ltd., was recently appointed sales-representative for The Guiberson Corp. at Houston, Texas. Dolton L. Moss, formerly store manager for Jareckie Manufacturing Co., Odessa, Texas, has joined Guiberson in its west Texas territory.

Fluor Advances Dieter and Nagel

J. P. Wiseman, vice president in charge of sales for the Fluor Corporation, Ltd., Los Angeles, announces the appointment of George H. Dieter to general sales manager, Los Angeles, and R. E. Nagel to assistant sales manager in charge of Fluor's Chicago sales office.

©Fabian Bachrach

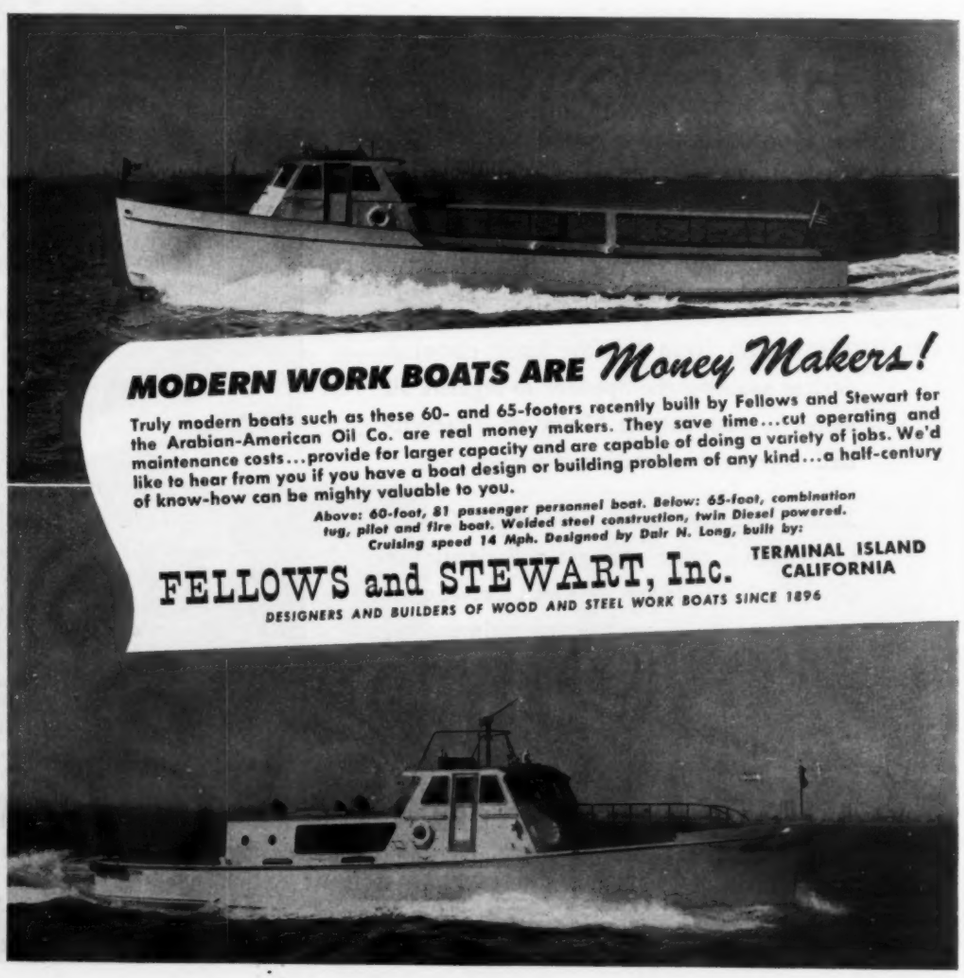
Left to Right: M. P. Venema, George A. Bockman.

Heads Radio Manufacturing

Frank B. Powers, formerly assistant vice president, production, of the American Car and Foundry Co., has been appointed director of manufacturing operations of Federal Telephone and Radio Corp., Newark, N. J. Mr. Powers will be responsible for telephone, radio, selenium rectifier, intelin cable and vacuum tube operations of the company.

Kaskade Brochure Published

The Koch Engineering Co., Wichita, Kansas, has published a new brochure on the Koch Kaskade fractionating tray. This brochure gives information on the performance of Koch Kaskade trays in distillation, absorption and liquid-liquid extraction. Copies are available on request.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ECA VIEWS EUROPEAN REFINERY OPERATION

By Joseph B. Huttlinger

Washington

When the Marshall Plan for aid to the countries of western Europe was in the formative stage it was recognized that oil was a fundamental factor in the economic recovery of the nations included in the project. Estimates were made that as much as 20 percent of the relief to be provided might take the form of petroleum products and financial aid in building up production and refining in the sixteen countries concerned and in their dependencies. The products were necessary to provide a basis for agricultural and industrial recovery, and the refining facilities to enable the several countries to lessen the drain of foreign exchange by enabling them to import crude oil instead of finished products, and incidentally to provide some additional employment.

At that time the Congress of the United States, influenced no doubt by a somewhat widespread opinion among the general public that the domestic oil industry might not be able to maintain production sufficient to keep pace with the rapid growth in home demand, stipulated that ECA, so far as possible, should make its purchases of oil from outside the United States. Meanwhile the fear of possible shortage has disappeared and has been replaced by predictions in various quarters of an impending world surplus of production. At the same time the enthusiasm with which the nations of western Europe have responded to the suggestion of expanding their refining capacity has raised the possibility that some of them will be in a position, not only to satisfy their internal requirements, but will have a surplus for export with no markets available.

The crux of the problem is, of course, not merely the extent of the rise in world production but the speed of European recovery and the consequent growth in demand for petroleum products from western Europe, which, next to the United States, is the largest consuming market. The Organization of European Economic Cooperation, which is a council made up of representatives of the Marshall Plan countries, acts in an advisory capacity to ECA. It collects information on industrial conditions and from time to time prepares estimates of the probable course of demand, obviously a difficult undertaking because of the many uncertainties involved. The latest report of OEEC, published in October last, forecast an increase in consumption of petroleum products between the current year and 1952-53 of approximately 12 million metric tons or about nine percent per annum. At the present time the use of gasoline is still below that of the prewar year of 1938, while the demand for distillate fuels has risen nearly 70 percent and is expected to increase another 28 percent by 1953, the final year of the Marshall Plan. By that date refining capacity in Europe is estimated at nearly 1,248,000 barrels daily, or roundly 63,375,000 metric tons for the year, if the various construction plans now on foot are completed. A revised estimate reduces this to 1,212,000 barrels daily.

In the opinion of ECA officials the projected European refinery program is overambitious and

(Please turn to Page 54)

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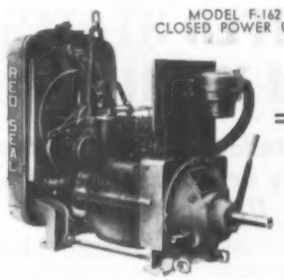

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The ECONOMICS of UNITED STATES and WORLD OIL

A detailed study of the law of supply and demand in terms of U.S. and world oil.

Being an outline and analysis of how the basic economic factors governing oil supply, demand, price and time lag of the United States oil industry and other factors of the countries abroad control and will govern the future development of the world oil industry.

by
E. Ospina-Racines

Member, American Institute of Mining & Met. Engineers; American Association of Petroleum Geologists American Chemical Society; Sociedad Colombiana de Ingenieros. Author of "Economics of Oil Investments in Colombia" 1941; "La Economia del Petroleo en Colombia" 1947, etc.

CONTENTS - CHAPTERS

1. Pattern of the Oil Supply-Demand-Price Cycle.
2. Operation in U.S. and World Supply-Demand.
3. World Oil Demand and Markets.
4. Pricing Crude Oil in the World Market.
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ECA VIEWS EUROPEAN REFINERY OPERATION

(Continued from Page 53)

in the case of some countries might result in a supply of products in excess of their own requirements, thereby contributing to a world surplus and possibly leading to the erection of new trade barriers instead of encouraging the removal of such obstacles, the policy to which the United States is committed. ECA administrator, Paul G. Hoffman, has repeatedly emphasized the importance of keeping the expansion of refining facilities within conservative estimates of the probable increase in demand. Representatives of the petroleum section of ECA now in Europe are urging this point of view upon the members of OEEC.

Appearing Nov. 28 before a subcommittee of the House Small Business Committee, of which Representative Keogh of New York is chairman, Dr. O. E. Bransky, acting chief of the petroleum section of ECA, indicated that the United States endorsed tentatively an increase of refining capacity in the Marshall Plan countries to 1,010,000 barrels daily by 1952-53. This is an increase over the figure of 840,000 barrels daily suggested by ECA over a year ago but is a substantial reduction from the figure of 1,248,000 previously put forward by OEEC.

Discussing the situation, Dr. Bransky said: "As you are well aware, there is a world surplus of both crude oil and refined products at the present time. The application of various estimates of future demand to the statistical summary of company plans seems to indicate an even greater world surplus in 1952 and 1953.

"However, all such estimates of future demand are based on assumptions that might easily be disproved by future trends. Thus it is difficult to assess the effect of any relaxation of rationing regulations in Europe on future consumption. Furthermore, the potentialities for consumption, as Europe begins to make greater use of automobiles, trucks, tractors and other oil-burning equipment, are enormous. Thus in Europe demand depends to a considerable extent upon governmental action in the short run, and upon the degree to which an expanding economy is achieved in the long run." As for the future, he said: "ECA will continue to refuse financing of projects, the output of which can be sold only by resorting to discriminatory trade practices."

Actually, of course, ECA cannot control the expansion of European refining except to a limited degree. Many of the projects now under way, which are estimated to involve an aggregate expenditure of a billion dollars or more, are being financed by individual oil companies and require no assistance from ECA, while others are joint enterprises of governments and private capital. Probably not much more than a third of the total will involve the use of Marshall Plan funds. As to these ECA approval is necessary, and it can exercise a moral influence on others in view of the decisive part that it is playing in the general recovery program. So far as its authority extends, it will be used to prevent the creation of conditions that might defeat its fundamental policy of establishing greater freedom of commercial intercourse among the nations of western Europe.

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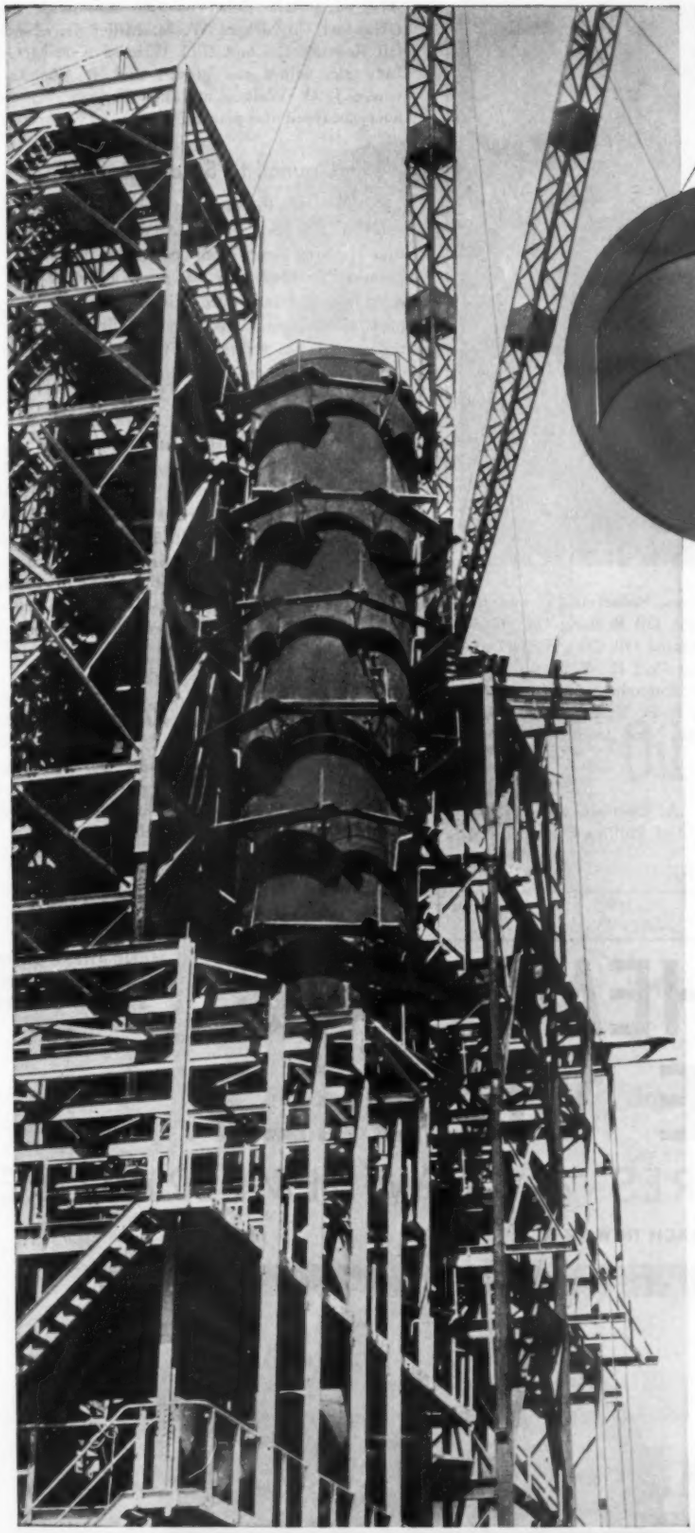
French Octane Rating

By decision of the French Ministry of Commerce, the minimum octane rating of French gasoline was raised to 70 on Jan. 1, 1950.

Walton Elected Ideco Executive Vice President

The election of George W. (Jack) Walton as executive vice president and a director of International Derrick and Equipment Co. has been announced by J. M. Gardner, president. Mr. Walton formerly was vice president in charge of Ideco machinery and export sales division. He joined Ideco in 1949. Previously he served National Supply Co. in the United States and in England; later associations were with the Wilson-Snyder Mfg. Co., with Emsco, and with Unit Rig and Equipment Co.

George W. Walton



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Visit New Cosden Plant

The executives of The Refinery Engineering Company of Tulsa were hosts on Tuesday, Dec. 9, to a group of refinery men who were taken on a tour of the new refinery of The Cosden Petroleum Corp. at Big Spring, Texas. Shown boarding the plane at Tulsa are, left to right: W. H. Grosse, Universal Oil Products Co.; T. M. Lumly, president, Refinery Engineering Co.; T. B. Randall, Midland Cooperative Wholesale; L. G. Molique, Phillips Petroleum Co.; R. W. Griffith, Barnsdall Oil Co.; C. C. Tate, Phillips Petroleum Co.; T. J. Williams, Roosevelt Oil and Refining Co.; F. Frey, Johnson Oil Refining Co.; G. L. Barker, Tide Water Associated Oil Co.; W. J. Leenhouts, Johnson Oil Refining Co.; R. W. Davis, Deep Rock Oil Corp.; Harold Bottomley, vice president, Refinery Engineering Co.; R. B. Tuttle, Oil and Gas Journal, and D. O. Givens, vice president, Refinery Engineering Co.

Standing on steps are F. A. Deering, Kanotex Refining Co. and P. M. Wadill of Phillips Petroleum Co.

The party left Tulsa at 9:00 AM with stops at Oklahoma City where W. M. Miller Jr. of Mercury Oil Refining Co. and Cliff Wise of Kerr-McGee Oil Industries joined the group; and at Wichita Falls where J. O. Walkup of The Waggoner Estate Refinery boarded the plane.

Council to Study Restrictions

The National Petroleum Council is undertaking a study of the effect on the American petroleum situation resulting from recent action by the British Government in restricting sales activities of American companies in the United Kingdom and certain other parts of the Empire. Walter S. Hallanan, chairman of the council, has written to Frank M. Porter, chairman of the committee on imports, directing a study.

Last August the committee stated the need for an analysis of world markets and supplies in the light of political and exchange considerations. Chairman Porter suggested that British, Canadian and Mexican oil will be bidding for markets now supplied by America. He pointed to the British expansion with dollar assistance from ECA as raising serious considerations for the American oil industry. Subsequently the Secretary of the Interior expressed concern about the competitive situation and urged the committee to develop constructive ideas.

As this is written the British cancellation or reduction of import quotas has spread from the British Isles to Australia and India. Currency restrictions will affect Japanese trade. Supply sources in Sterling territory such as Bahrien also will be affected by the British moves to improve the financial situation of the Empire by expanding its oil trade.

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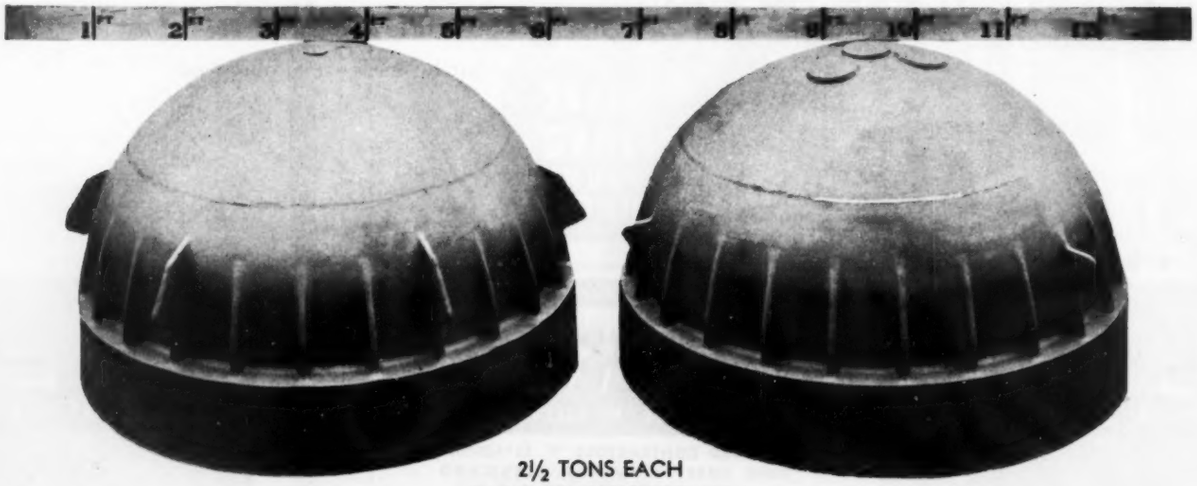

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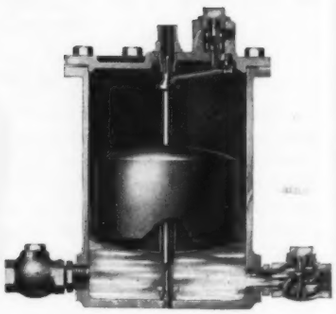

AUTOMATIC PUMP

combines the good qualities of a pressure pump and a vacuum trap. Pumps condensate from low-pressure or vacuum vessels and lifts up to fifty feet; pumps boiling, cold or gaseous fluids (including oils); pumps petrol, benzine, dye liquors and alkaline liquors such as caustic, ammonia, etc.; drains sump holes, pits, excavations (where it may be fully submerged). ENTIRELY AUTOMATIC. *Details of "Ogden's Patent Pump" (in five sizes) from:* OGDEN & CUNLIFFE, (Petroleum Dept.) Charlton House, Cheltenham, Glos., Eng.

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Celebrates Sixtieth Anniversary

Chicago Bridge and Iron Co. recently celebrated its sixtieth anniversary. To commemorate the event, Milo E. Smith, editor of the company's house magazine, The Water Tower, published a history of the company which was illustrated by photographs of early tankage construction jobs in oil and other industries. Shown above is the first installation of Hortonspheres designed to operate at 25 psi. The spheres were erected for The Texas Co. at its Port Arthur, Texas, refinery in 1923. The Hortonspheres were followed within a few years with Hortonspheroids designed to operate at intermediate pressures ranging from five to 15 psi.

New Line of Trucks

A completely redesigned and re-engineered line of International motor trucks, entirely new from front bumper to tail light, has been announced by the International Harvester Export Co. This new and complete line of heavy-duty engineered trucks, designated as the L-line, consists of 87 separate basic chassis models, built to handle every conceivable type of hauling job. They are being presented by International Harvester affiliate firms in 18 countries and by distributors throughout the world, C. E. Stevens, export manager of International truck sales, stated.

The new L-line is generally divided into four classifications of four-wheel model trucks—the Standard, ranging from 4,200 to 40,000 pounds gross vehicle weight; the Busmaster, comprising five bus models, ranging from 12,500 to 24,000 pounds GVW; the Loadstar, ranging from 16,500 to 29,500 pounds GVW; and the Roadliner, ranging from 16,000 GVW for a gross combination weight (truck-tractor and trailer) of 29,000 pounds to 30,000 pounds GVW, for a gross combination weight of 60,000 pounds.

The new International line further features new Metro-body multistop units, product of the company's Bridgeport, Connecticut, plant, ranging from 5,300 to 10,000 pounds GVW and including three different body sizes, one adaptable for use as a bus.

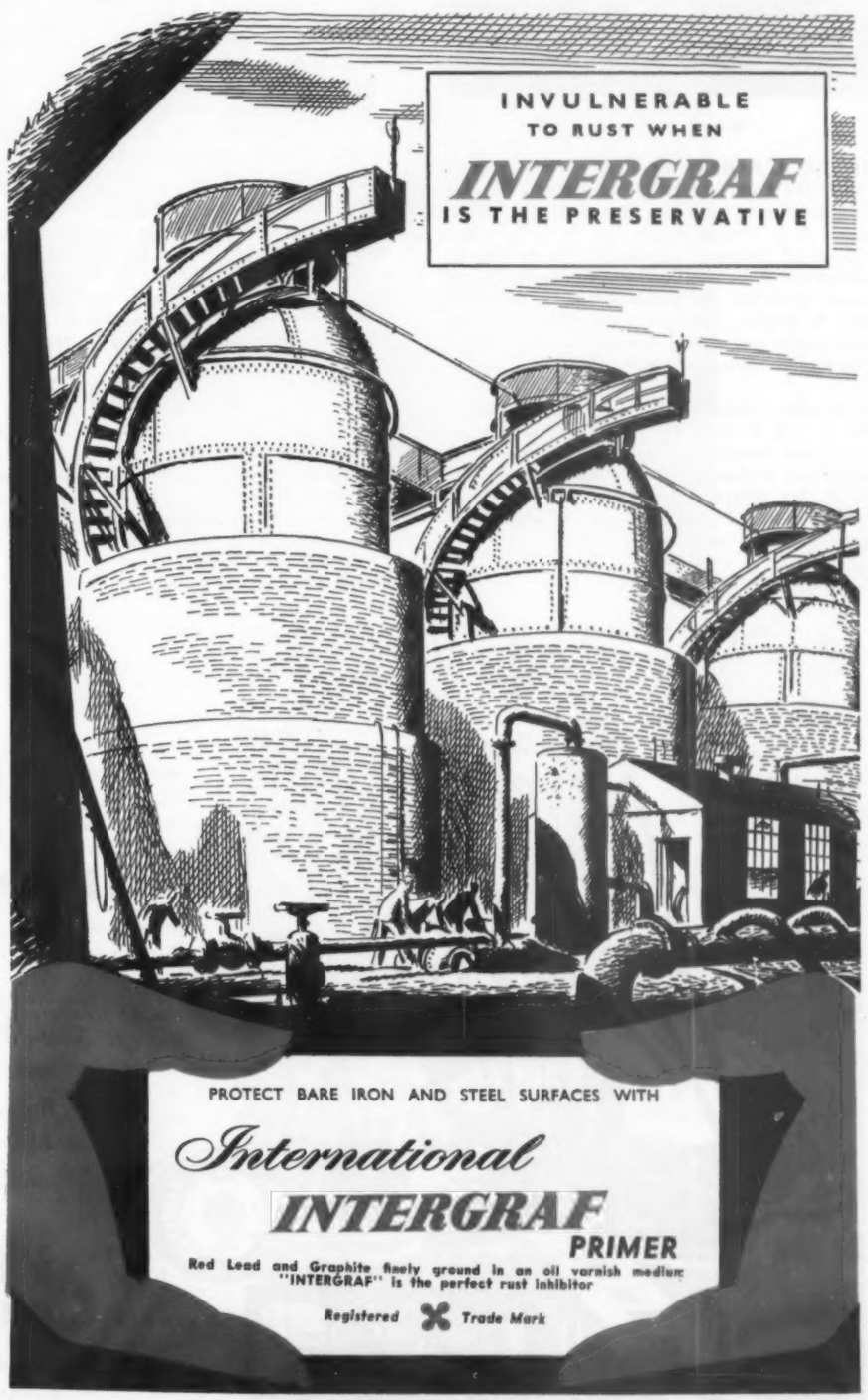
There is a new group of six-wheel chassis units, ranging from 22,000 to 50,000 pounds GVW, and a new group of cab-forward chassis units ranging from 14,000 pounds GVW.

The company's West Coast trucks, manufactured in International's Emeryville, California, plant, include two highway and four off-highway vehicles, ranging from 30,000 to 90,000 pounds GVW.

Biggest change in chassis dimensions is in the wheelbases, which have been shortened as much as seven inches in some models. The shorter wheelbases, together with re-proportioned cab-to-rear axle dimensions and front-axle-to-cab dimensions, have resulted in a shifting of load weight, so that it is in balance between front and rear axles.

Mexican Refinery

Senator Bermudez, chief of Petroleos Mexicanos, has announced that work will begin immediately on the erection of a refinery at Reynosa, Mexico. The plant, of 5,000 barrels daily capacity, will be equipped in part with machinery removed from the Bela Vista refinery near Tampico which is to be dismantled. Plant facilities will be modernized by the addition of equipment to be purchased from the United States, and the installations are expected to be completed before the end of 1950.



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William A. Berryman

WILLIAM A. BERRYMAN, elected vice president of Gulf Oil Corp. last May, has assumed direction of the company's foreign marketing operations. He succeeds B. P. Newton who retired as vice president in charge of foreign operations. Mr. Berryman will be assisted by F. C. W. Paton, who has been appointed assistant to the vice president, and by R. F. Temp and James H. Mayes, who have been appointed respectively eastern and western hemisphere representative of the foreign marketing department.

Mr. Berryman joined the foreign marketing department of Gulf in 1933. He assisted in the management of some 30 subsidiary marketing companies from headquarters at Antwerp. At the outbreak of World War II, Mr. Berryman returned to Pittsburgh, and in 1945 was named assistant to the vice president in charge of foreign marketing.

Mr. Paton joined Gulf in 1939 and served as director of foreign supplies until his present appointment. Mr. Temp has served the company for the past 16 years in Spain, Belgium and Denmark. At the time of his present appointment he was a resident of Copenhagen, Denmark, and a director of the Danish-American Gulf Oil Co. His new headquarters will be in Antwerp. Mr. Mayes was retained as the foreign marketing department's representative in Washington, D. C., in 1948. He had been in government service and employed by the Standard Oil Co. (N. J.) in Central and South America.

W. O. TWAITS, formerly manager of the coordination and economics department of Imperial Oil Ltd. in Toronto, has been transferred to the producing department, western division, Calgary, in the capacity of management assistant. Mr. Twaits became assistant budget controller in the manufacturing technical committee in 1939. He was transferred to Toronto in 1945 as assistant economic coordinator and two years later was appointed manager of the coordination and economics department. He is succeeded by John F. Fairlie, formerly assistant manager.

DR. GEORGE M. SAUNDERS of St. Louis has been appointed medical director for overseas operations of the Socony-Vacuum Oil Co. Inc. Dr. Saunders, who is associate medical director of the Monsanto Chemical Co. and associate professor of preventive medicine and clinical medicine at Washington University School of Medicine will assume his new duties Jan. 2.

New LPG Plant

Socony-Vacuum Oil Co. Inc. has opened a new plant in Burlington, Vt., for filling and distributing LPGas in Vermont, New Hampshire and upper New York state. The product for this area was formerly supplied by the company's manufacturing plants in New Jersey and, more recently, from Maine.

DAVID D. IRWIN of Chicago, vice president for transportation and supply of The Pure Oil Company, has relinquished his full-time responsibilities with the company but will continue in an advisory capacity. He has been with Pure for 15 years. He is succeeded by Kenneth A. Covell, assistant vice president for transportation and supply.

JOSEPH A. COSTELLO has been elected a vice president of Ethyl Corp. He has been with Ethyl for more than twenty years and has been assistant general manager of manufacturing for the past five years. He joined Ethyl as a field representative in the sales department and served subsequently as manager of the Atlanta and New York sales divisions. For two years during the war he was on leave of absence as special assistant to the director of refining in the office of PAW in Washington, D. C.

Joseph A. Costello

Erecting a new portable mast

A Shell photo

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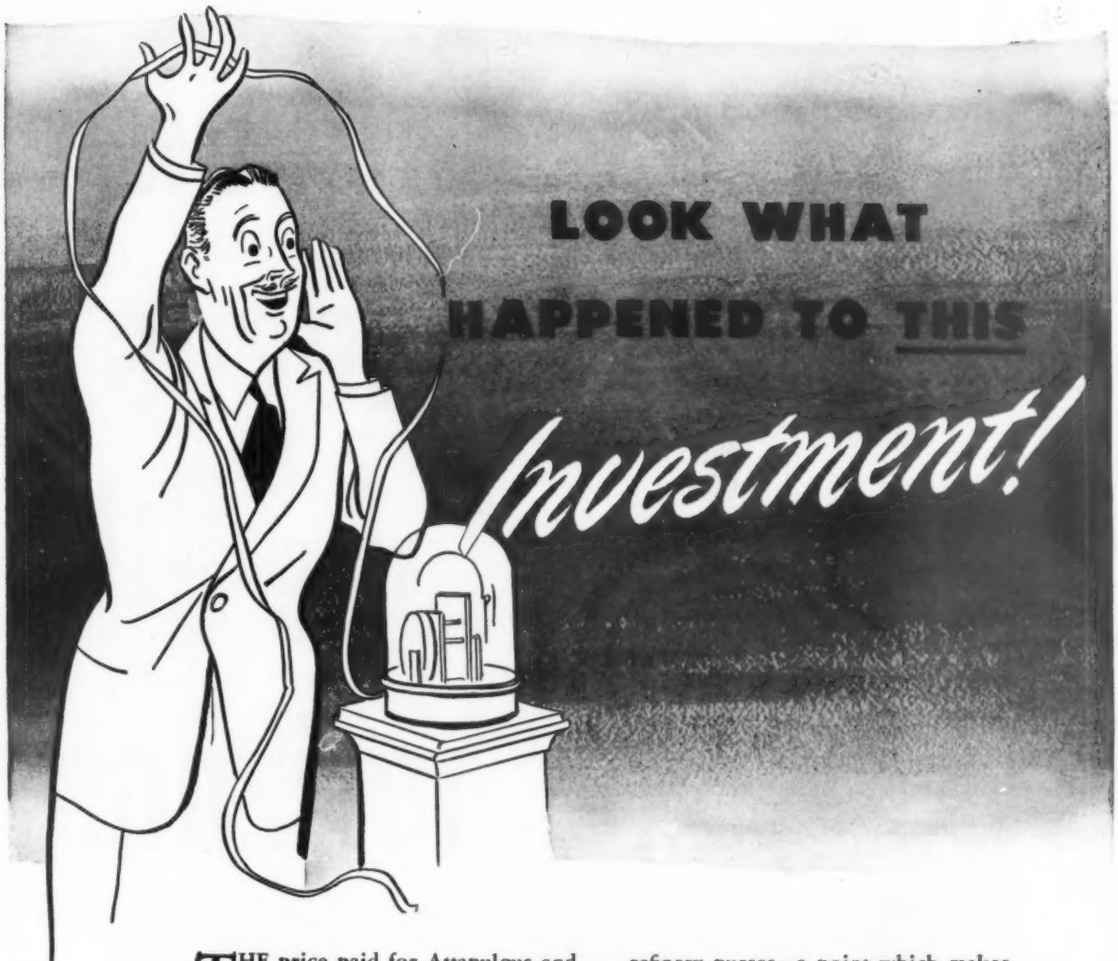

THE price paid for Attapulgus and Porocel adsorbents is around *one cent* per pound—a fact which, we will agree, makes pretty dull reading. But for refiners using our materials, this modest investment pyramids to phenomenal returns. To be specific, each pound properly applied to petroleum stocks increases their value by at least *one dollar*—a return of 100 to 1.

Some four billion pounds of fullers earth and bauxite have been shipped to refineries by Attapulgus and Porocel—a noteworthy record of service to the industry. But what is even *more* noteworthy is the fact these materials have put four billion dollars into refinery purses—a point which makes *good* reading.

That's the record to date. It was accomplished by adsorbent-treating a wide variety of hydrocarbons to effect reduction or removal of colors, odors, tastes, moisture, sulfur, acids, fluorides and unsaturates, and for catalytic purposes. It's a record for *you* to tie to when considering plans to improve quality, expand output, or both.

Consult with us freely. Our broad knowledge of the behavior of our products under many sets of conditions should go far in helping *you* get 100 for 1.

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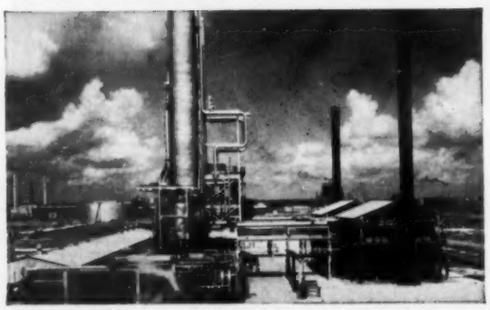
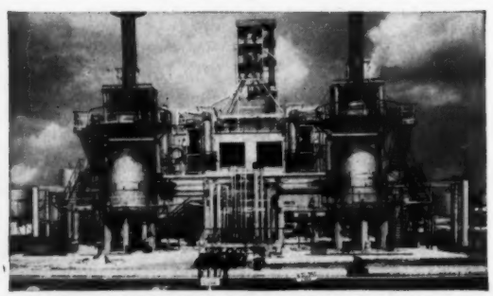
Cit-Con widens Lube-Oil horizons

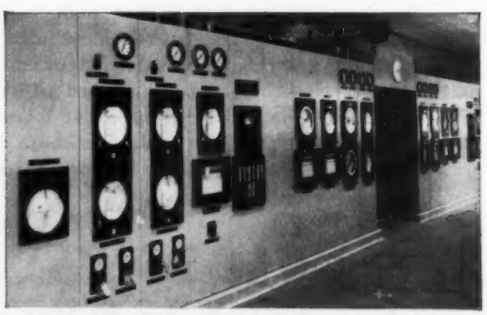


Cit-Con's "twin" vacuum distillation units shown here can each handle 12,500 barrels a day of reduced crude. Design provides over-capacity to produce a higher proportion of neutral oils to bright stock when required.



Lummus vertical heaters distinguish Cit-Con's two identical clay contact plants. One handles light distillates; and the other, heavy distillates and bright stocks.

The new Cit-Con lubricating oil plant at Lake Charles, La., is an outstanding example of Lummus' design and construction. From the beginning, the project kept pace with pre-planned schedules. Currently, operations and products are meeting the most modern standards.



Vacuum units have a common, streamlined control room. This view shows instrument board and instruments for both of the distillation units.

This air view shows the L-shaped layout of the processing units. From right to center foreground can be seen, in order: vacuum distillation units, solvent refining units, and the boiler house in the corner. Continuing to the left around the L are the two MEK dewaxing units, the clay contact plant, and the wax finishing unit.

The furfural extraction unit is of exceptionally high capacity with two stages of furfural recovery on the raffinate system and four stages on the extract system. The solvent circulation rate is 30,000 barrels daily.

This general view shows in close-up, from left to right, MEK dewaxing units No. 1 and 2, and the clay contact plant. The No. 1 MEK plant for light distillates has recrystallization facilities which may be equipped later for incremental dilution. The other plant for heavy intermediate distillate and bright stock is presently equipped with repulping facilities to reduce oil content of the amorphous type wax.

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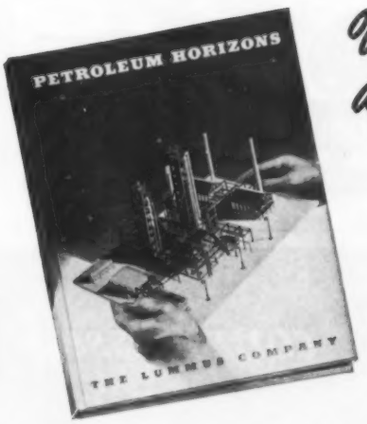

PETROLEUM HORIZONS, the new 80-page book on Lummus processes and plants, features a step-by-step description and flow sheets for 31 refinery processes. It brings you complete details on the background, organization and world-wide services of the Lummus Company.

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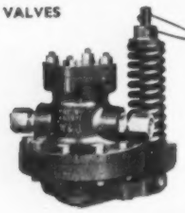

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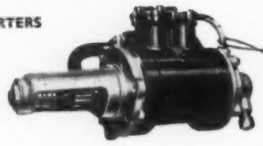

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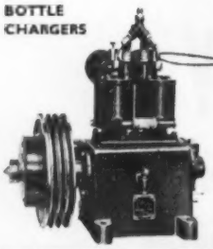

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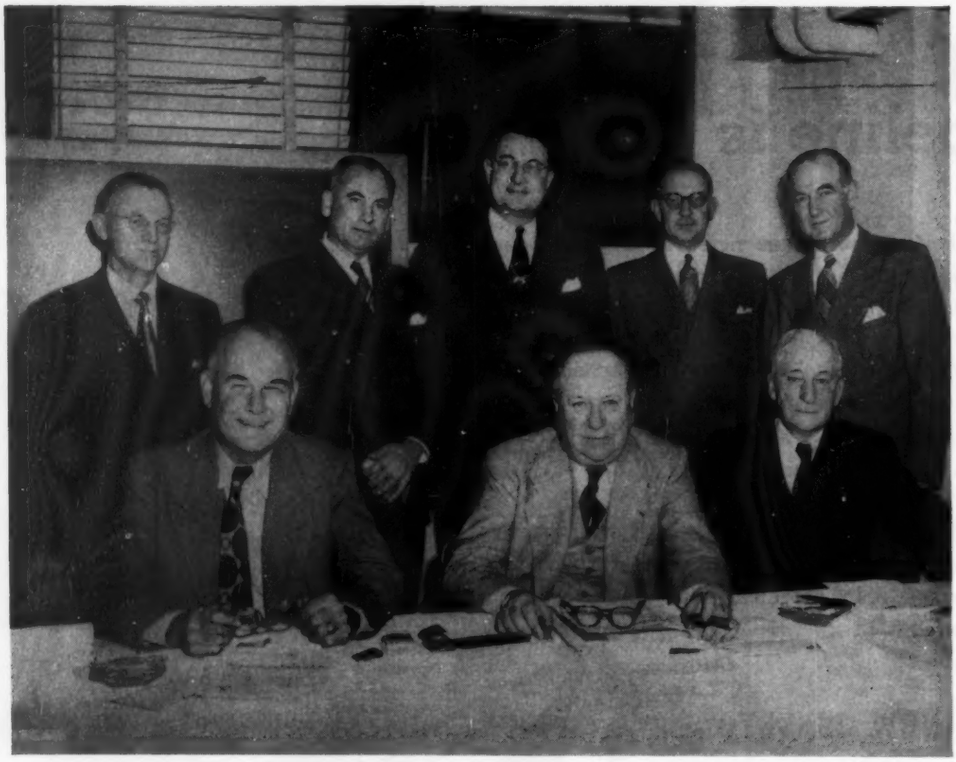


Nomads national board of regents in business session at Chicago during the recent API meeting. Left to right, seated: F. C. Ripley Jr., regent, Los Angeles chapter, national secretary treasurer; R. J. Eiche, regent, Los Angeles, national chairman who called and presided at the meeting; H. M. Cosgrove, executive secretary, Tulsa. Standing, left to right: Charles Smythe, regent, Houston; Brad Mills, regent, Dallas; K. O. Hoevel, president Tulsa chapter, proxy for A. Gibbon, Tulsa; Val Wittich Jr., regent, New York; F. C. Brinegar, regent, Dallas. Attended meeting but not in picture: M. D. Gilbert, regent, Tulsa; Homer Thornhill, regent Houston. At this meeting the request of Dallas chapter to change its name to Dallas-Fort Worth was unanimously authorized.

Tapline Segment Completed

A 314-mile segment of the 30-31-inch oil pipeline being constructed across Saudi Arabia has been completed as part of the Arabian American Oil Company's gathering system. Aramco's pipeline system now consists of the 314 miles of large-diameter pipe and 190 miles of 10, 12, 14, 20 and 22-inch lines, in addition to 167 miles of 3, 4, 6 and 8-inch flow lines.

The 44-mile Abqaiq-Qatif section of the pipeline system was completed for Aramco by Trans-Arabian Pipe Line Company more than a year ago and has been in service delivering oil to Ras Tanura since then. The balance of Aramco's gathering system to a pump station at Hafar al Batin has now been completed and linked to the Quatif-Hafar section.

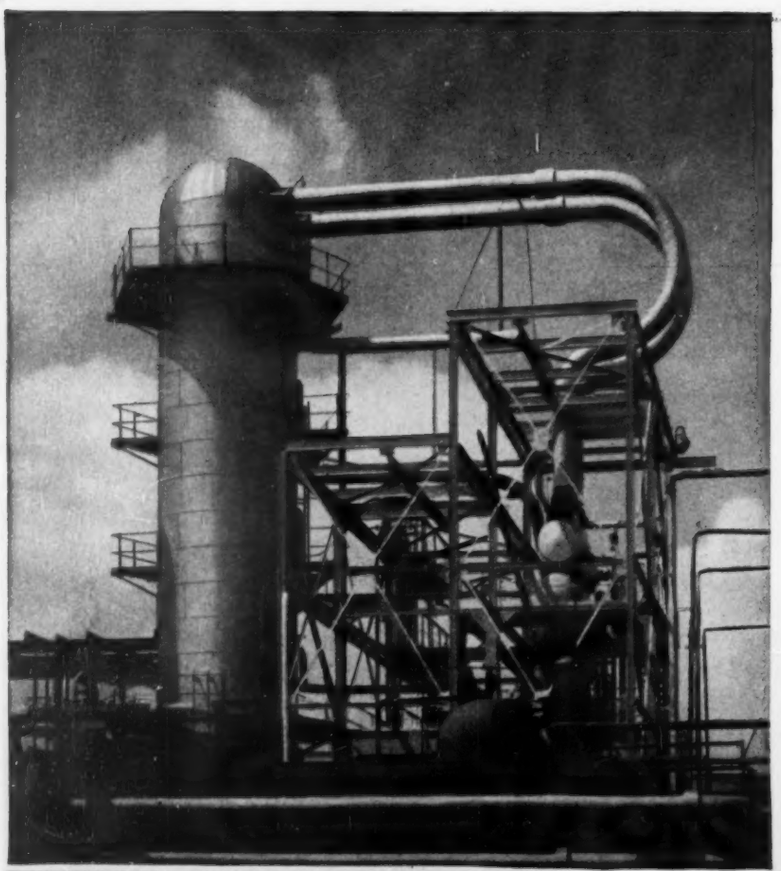
Aramco plans to install a tank farm at the Hafar al Batin pump station where oil destined for delivery at Trans-Arabian Pipe Line Company's projected terminal at Sidon on the Mediterranean, 753 miles from the point of connection with Aramco's pipeline system, will be gauged in the same way that oil shipped offshore in the Persian Gulf is gauged at Ras Tanura.

Sales Engineer Appointed

George J. Barry has been appointed wire rope sales engineer for The California Wire Cloth Corp., subsidiary of Colorado Fuel and Iron Corp., manufacturers of Wickwire Spencer wire rope. Mr. Barry was formerly affiliated with the Bethlehem Pacific Coast Steel Co.

Graver Representatives

Graver Water Conditioning Co. has appointed three engineering representatives as its sales agents. These are: J. R. Fortune & Son, Detroit, Mich.; The Stapp Engineering Co., Denver, Col.; and Process Equipment Co., Tulsa, Okla.



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Even after oil is found, development of the field entails great cost. New wells must constantly be drilled to replace depleted wells—and so maintain petroleum supply.

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And finally serve it—
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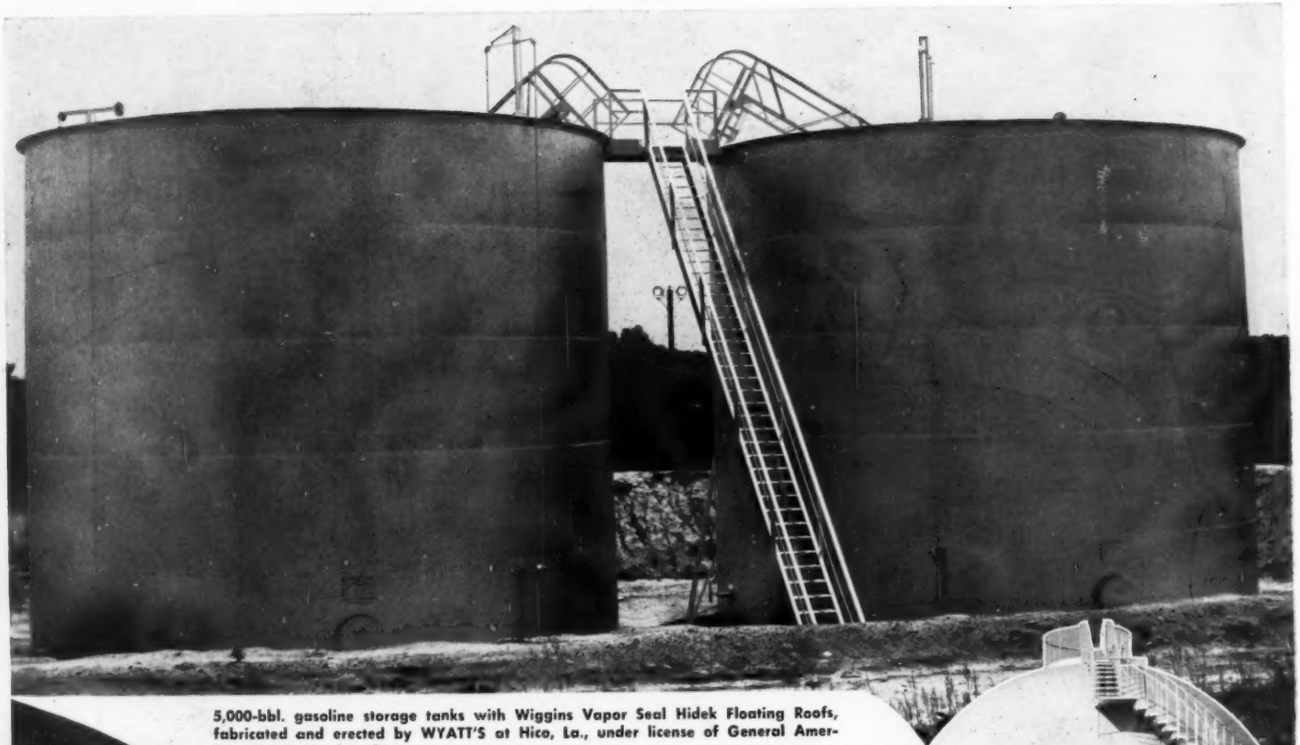
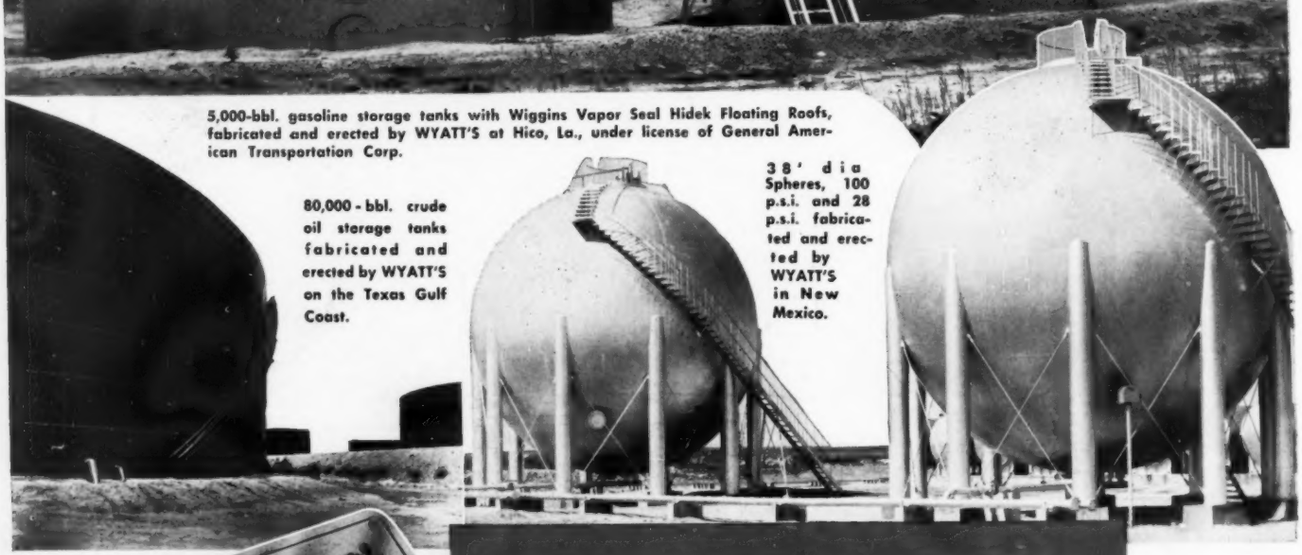


5,000-bbl. gasoline storage tanks with Wiggins Vapor Seal Hidek Floating Roofs, fabricated and erected by WYATT'S at Hico, La., under license of General American Transportation Corp.



80,000-bbl. crude oil storage tanks fabricated and erected by WYATT'S on the Texas Gulf Coast.

38' dia Spheres, 100 p.s.i. and 28 p.s.i. fabricated and erected by WYATT'S in New Mexico.

Wyatt's
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Safely Locked in

Butane - Propane Storage in North Louisiana, fabricated by WYATT'S